



Treatment of the Antrum Through a Root Canal.

By J. W. MEADOWS, D.D.S., L.D.S., Vienna, Austria.

In the ITEMS OF INTEREST for February, 1900, I noticed an article by Cuvier R. Marshall, A.M., M.D., entitled Disease of the Maxillary Antrum Successfully Treated Through a Root Canal, and I am tempted to place on record a report of the following case.

About two years ago, Fraulein W. came to me complaining of pain in the face, with a flow of pus from the nostril. She had at first gone to a specialist in diseases of the nose, who, having treated the case for some time with no apparent success, advised her to go to a dentist, who would extract some offending teeth, which he supposed to be the cause of the antral trouble. I had already had one case in my practice, where the abscess had pointed on the palate opposite the first molar and which yielded after about six weeks treatment of syringing out the maxillary sinus through the opening in the palate. The patient had no further trouble, the cause evidently having been an acute catarrh, the inflammation having extended to the mucous membrane of the sinus, the origin, I believe, of a majority of such cases.

In the case of Fraulein W., having examined all the teeth and finding no apparent cause for the lesion as far as the teeth were concerned, I determined not to extract a tooth to obtain access, but to devitalize the second bicuspid, and to enter the sinus through the root canal. My diagnosis was inflammation of the mucous membrane of the maxillary sinus, occasioned by an acute attack of rhinitis. Having removed the pulp and enlarged the canal until the complete entrance of a hypodermic syringe into the sinus was permitted, I first syringed the sinus very thoroughly with warm water, afterwards, with a dilute solution of lysol, considerable pus of a yellowish and viscid nature coming away by this procedure. Having closed the canal, I made an appointment for the next day, by which time the patient observed that the pain, heat and sense of heaviness of the affected side, had vanished, but that a quantity of pus still

escaped through the nostril. I repeated the washing out with warm water and dilute lysol. One of the first surgeons of Vienna and head surgeon of one of the hospitals here happened in and on seeing the case, was of the opinion that it was impossible to cure such a case without an operation, namely, that of opening into the sinus through the alveolar wall with the subsequent insertion of a canula. This I would not do on account of the deformity and the very great inconvenience caused to the patient. After having treated several times in the above named manner, I injected a weak solution of iodine into the sinus to provoke resolution. In three or four days the flow of pus had completely stopped. I carefully filled the root canal with gutta percha, and since then there has been no further trouble.

I would like to hear the opinion of others, who have had experiences as to whether we may believe that such cases are more often the result of an acute catarrh, which has extended to the mucous membrane of the antrum, than that they are caused by inflammation at the roots of dead teeth.

Inefficiency of the Dental Society Reporter.

By FRANK W. SAGE, D.D.S., Cincinnati, O.

As a dentist, and as an ex-reporter of dental society proceedings, I was interested in Dr. Wm. H. Trueman's paper in the October *ITEMS OF INTEREST* dealing with this general theme. His criticisms summarized are substantially as follows: the reports of today, while fuller than formerly, fail in point of grammar, diction, style—in short, they are not what the profession, looking for intelligible reports of society proceedings, have a right to expect. Blackboard talks in particular are presented in crude, unintelligible form, without an accompanying diagram, or without regard to the relation of the spoken words to the diagram, etc., etc.

Dr. Trueman's suggestion is for careful editorial revision of the reporter's work, and this revision the reader is left to infer is all that is required to change the chaotic mass of mere "words, words," into intelligible reading matter. The suggestion is good, and may be regarded as all-sufficient, as regards papers (which Dr. Trueman expressly mentions), but as regards the reporter's transcription, it is wholly inadequate. The editor cannot revise the reporter's work; it is doubtful whether the reporter himself could do it satisfactorily.

Why not? Let us consider.

As ordinarily is the case a stenographer is employed to make a verbatim report of discussions and all observations apart from the reading of

papers. This he does, and the members look for a satisfactory report. Then when the report appears, another statement of Dr. Trueman's finds verification, almost invariably, "the verbatim report proves to be not the proper one for publication." Now what is wrong; who is to blame? Let us consider further, from the reporter's point of view, this time.

Supposing we confront the delinquent (reporter) **The Reporter's Work.** with the evidence of his shortcomings, charging him thus and thus: "You have a sentence filling four lines of the journal, at this point, which has no ending such as a complete sentence should have. Why did not you finish it? Here you have an entire page filled up with matter not in the least pertinent to the subject under discussion; why did not you leave that out? And here is Dr. Blank's speech given in full. It seems to have neither beginning, middle nor end. How is this?"

To all of which the culprit might reply justly in these general terms: "I have reported the speaker's exact words. If the sentence has no proper ending that is his fault. I have no authority to supply words at my discretion. Even if I had not all I could do to keep up with the speakers; even if I knew a speaker was not really saying what he meant to say, it is not my province to make over his speech for him. I am paid to report."

As to editorial revision, the editor who undertook **The Editor's Work.** to go over the reporter's transcribed notes, with a purpose of amending, condensing and otherwise improving the speaker's words, would find that he needed often to improve the ideas, and there he has no more authority than has the reporter. The trouble is too often with the speaker, not with the report. Even fairly accurate speakers occasionally leave their sentences "in air"—that is, unfinished, and with nothing about the unfinished end to suggest in the least, what they meant to say further. This will occur even when the speaker has his ideas all correctly formulated in his mind; how much more frequently must it occur in the instances of other speakers who have no definiteness of ideas when they rise to speak?

It will be seen, then, that the difficulties which the reporter in the dental society is expected to surmount, are somewhat formidable. What wonder is it that even the most skilful verbatim reporters fail!

Before suggesting what I believe to be an efficient **Wandering** remedy for all this, allow me to gossip a little longer **Discussion.** on this line. In dental societies the members often wander away from the subject from the very beginning, never getting back. Dr. Crank interrupts Dr. Blank with a query, in answering which Dr. Blank runs on and on, not knowing that he has left the path of discussion proper, or not really caring. The reporter may be

astute enough to perceive this, but he is being paid perhaps, by the folio, and what odds is it to him? One grist is as good as another in his mill.

It often happens, though, that these asides are worth more than anything the speaker would be likely to say if recalled to the subject properly under discussion. The reporter, if also a dentist, may quickly perceive this. My own feeling has been that the object of a dental society being the cultivation of professional amenities, the cementing of friendly relationships, and the stimulation and encouragement of the members, as much as the dissemination of knowledge, anything that goes to make the report interesting, even if not exactly in line with the discussion, ought to go into the report.

It often happens that the proceedings of a dental society are not worth reporting. It seems to be wholly a question of spirit or lack of spirit, in the opening of the meeting, whether the discussion is to live or die. A pity it is that every dental society discussion cannot be opened by a McKellops, who was wont to fire his hearers' hearts with the earnestness and zeal of his utterances, often turning on a tide of burning eloquence which roused others, even the most timid and clumsy speakers, to unusual effort, so that not a moment was wasted, and not a speaker failed to say something worth presenting. Dr. Wm. H. Atkinson, too, was a capital stirrer up of enthusiasm, although he sometimes overawed all but the old stagers, by his show of erudition. In all seriousness, a good, rousing speaker to lead off is the very life of a discussion. Without your first-class discussion how are you to expect a first-class report? Let our committees on program carefully consider this. The speaker who early in the meeting stirs the audience by the fire of his eloquence, causing the late-comer to enter the hall on tip-toe, and the listless and indifferent in private conference in corners to prick their ears to hear what is going on, is the reporter's heaven-sent ally.

But to hark back to our reporter: the stenographer, employed to report verbatim, cannot be expected to do what would greatly improve any verbatim report, if he could and would do it; that is, go through the mass of his transcribed notes, pruning, re-arranging, condensing. Another plan is often feasible, however; let him apply to each member whom he knew not to have said what he meant to say, and in private interview draw out from him his ideas. But even that, to be successfully done, presupposes that the reporter is acquainted with dentistry, or at least with the special subjects discussed. Which again emphasizes an intimation of Dr. Truman's, that the reporter should be a dentist, too. For only a dentist could know that a member had not spoken to the point, or had failed to fully express his idea.

**Revision
by the Speakers.**

Only occasionally is it necessary that the speaker's exact words be reproduced in the report. If so required, however, some member or the speaker himself may usually be depended on to supply the words later. My own method has been to report verbatim only such speakers as are known to express themselves clearly and consecutively, making a synopsis of remarks uttered by others less accomplished. Speakers do not care so much to be reported verbatim, as to have their ideas correctly set forth. Furthermore, it is not always what the speaker actually said, which he prefers to have appear in print, but rather what he wishes he had said. Indeed most speakers when furnished with a copy of the reporter's transcription of their words, will ask to be allowed to change them. Some will alter their speeches throughout, substituting not only other words but other ideas. There seems to be no objection to this, unless evasion of some point educed, or total avoidance of it, should result. I have always assumed that anything which tends to improve the value of the report in the dental journal is admissible and advisable within reasonable limitations. I have known speakers to so revise their utterances in the debate, that hardly a line of the reporter's work remained. Here is a hint for reporters who despair of success in dental society reporting.

Yet there are times when it would utterly spoil a report to allow any man to revise his words. The shrewd reporter should be able to perceive the need of close attention, and his best verbatim work, when the argument becomes warm. The argument may be all wrong—even to reportorial ears—yet the coming game of cut and thrust, of give and take, which he scents, promises something far too lively and entertaining to be neglected. It is in the heart of an animated discussion that ideas are born and find fit expression, and the speakers will give him plenty of work which will require no revising. A good, lively, redhot discussion, bad grammar and all, will not hurt the circulation of any dental journal.

A reporter who knows dentistry as well as shorthand, will often find it inexpedient to attempt reporting verbatim, a certain class of speakers who express themselves in disjointed phrases, wander here and there, mixing up their words. The late lamented Dr. George Watt, famed as a chemist and teacher, as an editorial writer and a debater; was still a speaker of this description. He was readily enough understood by his hearers, but all but impossible for the reporters. Combining with his words of instruction little humorous asides which kept everyone in a pleasant humor, he wandered along after a leisurely fashion, leaving the subject to take care of itself, yet always saying something well worth hearing. Yet his words, if taken and printed verbatim, would have seemed an inextricable jumble. His subject and predicate were often too widely

separated to be found and put together by the reader, although one listening to his voice would manage to make the necessary connection.

So it may be said of many speakers; the better way to report them is to listen attentively, with a view to remembering the gist of their remarks, taking merely a word here, a phrase there, as an aid to memory later. Shorthand is not indispensable in this kind of work. With practice a clearheaded long hand writer may do almost as well as a skilled stenographer, better than two-thirds of the stenographers ordinarily employed by dental societies.

**Dentists as
Reporters.**

If our dental societies desire to improve their reports, let them select some young dentist of intelligence and education, who will devote himself to this work of reporting for two or three societies. He should be well paid for the service, which is never anything but most arduous. The old Mississippi Valley Association had for years a young dentist as reporter, who, with no knowledge of shorthand, rendered excellent reports. If the societies would pay such a man's expenses to their meetings, and an adequate fee for actual work performed, we might soon see an end of this verbiage and emptiness of which Dr. Trueman complains. As it is, we put into the hands of some commercial college fledgeling, with no other qualifications than ability to scamper over a page at the rate of a hundred words a minute, the difficult task of rendering an intelligible report of a dental discussion. That will not do. The profession needs trained dentists to do their reporting.

Finally, the dentists themselves need to learn to speak, to think coherently, and to express themselves on their feet. Before going to the dental meeting let every man know what subjects are to be discussed. Above all things, let every speaker adhere to the subject, and let the moderator promptly remind him, if he fails so to do. Many an interesting discussion has been ruined by irrelevancies heedlessly introduced. If a man says nothing worth recording, omit his speech, by all means.

Dr. Trueman's suggestion that blackboard demonstrations be accompanied in the report, by diagrams, is good. But even then the reporter may fail through the demonstrator's omitting something not obvious to the reader, though quite so to the spectator. For instance, the demonstrator points to the angle of his diagram marked "A," and says, "at this angle I begin and draw a line to this angle," etc. No mention in all this, of "A," or "B," or any letter with which he has marked his diagram. The reporter, fully preoccupied in taking the speaker's words, hears nothing to indicate which angle he means, nor can he tell, after it has been said, by glancing up. His only recourse is to the speaker, after the adjournment of the meeting.

Even after demonstrators have been expressly requested to remember the reporter, and assist him by definite statements, they do not seem to remember.

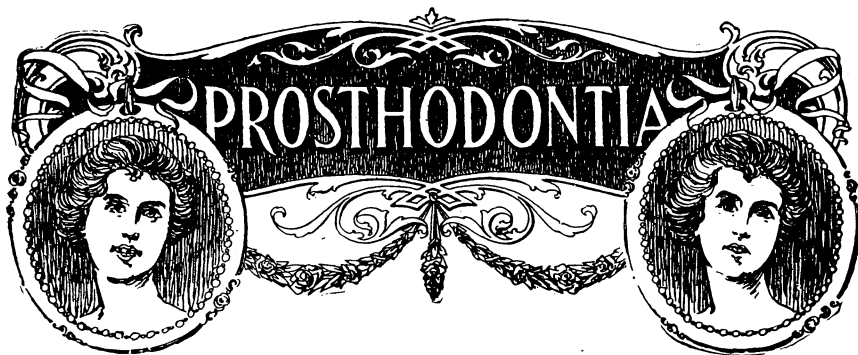
What adds tenfold to the difficulty of reporting in these instances, is the off-hand, informal character which the session often assumes, before long, in practical demonstrations on the blackboard. Members interrupt each other, speak disconnectedly and invariably leave much to inference. Whole speeches are made which omit important, even indispensable details, not to be supplied by any reporter, however familiar with the subject. Thus are the reporter's perplexities multiplied.

In general, a better report of discussions of any nature, might be had by either one of two methods.

A Remedy Proposed. The first suggestion is that the stenographer have constantly seated beside him some member familiar not only with the subjects discussed, but also with the styles of the various debaters. Let him give the reporter a hint, whether he is to report verbatim, or merely make a synopsis of the speech. (That is, take a word here, a phrase there, to aid memory later, when it comes to constructing the member's speech out of the fragments. That, however, is an art in itself, quite beyond any reporter not familiar with the substance of the subject being discussed. It requires the aid of his ally sitting beside him.)

The advantage of this plan is that it leaves the assistant free to give his undivided attention to the speaker's ideas, so that later he can supply what is required, being aided by the reporter's notes. At the same time, it saves the reporter a vast deal of useless shorthand work, conserves his energy, and makes it possible for him to confer with his assistant and do the extra work of revising, condensing, and so on, without extra pay.

The other plan I have already touched upon: employ a dentist reporter, placing no dependence on shorthand. A third plan is, employ no reporter; have it understood in advance, that each one participating in the debate, is to supply the secretary of the meeting with an abstract of his remarks. At all events, if a stenographer be employed, it should be understood that no one taking part in the debate, shall refuse to look over his own transcribed remarks and revise them so as to make them intelligible, if so requested to do. Let the penalty for a failure to do this be omission from the printed report.



Dowel Crowns.

By HART J. GOSLEE, D.D.S., Chicago, Ill.

XI.

(Continued.)

(The Logan Crown: Comparative Advantages and Disadvantages; Application; Mounting. With Band and Cap. Advantages; Procedure. Variation of Methods: Substituting Separate Dowel; Procedure. Increased Accuracy of Adaptation, Procedure. Porcelain Work. The Brewster Crown: Application. The "Fellowship" Crown: Application. Repairing. Tube Crowns: Application; Procedure. Temporary Crowns: Indications; Procedure; Use of Amalgam; Use of Vulcanite.)

The Logan Crown.

Of the various crowns with fixed, or inseparable dowels, the Logan crown, originally designed by Dr. M. L. Logan, and manufactured by the S. S. White Dental Mfg. Co., is, because of the almost unlimited variety of splendid forms and colors in which it is made, probably the most generally employed and universally adaptable.

The crown is made with a slight groove or depression in its base, immediately surrounding the dowel, thus forming an elevated rim around the edge which facilitates the adaptation, and, when not entirely obliterated by grinding, affords increased strength to the attachment by admitting of the presence of a greater quantity of the mounting material.

The dowel is of platinum and is baked into the body of the crown. It is flattened and tapering in shape, and adjusted in the crown with the greatest diameter placed *labio* and *bucco-lingually*, or in line with the direction in which the greatest stress is usually imposed; and a slight corrugated depression in each side aids the attachment of the mounting material. (Fig. 166.)

**Comparative
Advantages and
Disadvantages.**

While this form of dowel is based upon theoretically scientific principles, objectionable features of some importance often confront its too general application, and detract from its practicability. These constitute the possible weakening of small roots by the enlargement of their canals to the extent necessary to accommodate the greatest diameter of the dowel; the possibility of its



Fig. 166.

bending under the application of stress in the line of its smallest diameter, and the inherent weakness of a *platinum* dowel which is further annealed to its softest form by being subjected to the high degree of heat necessary to fuse the porcelain.

In many cases this required destruction of the root may leave it so weakened as to be more or less easily fractured, if no band is employed, which is not an uncommon occurrence; and the lack of *rigidity*

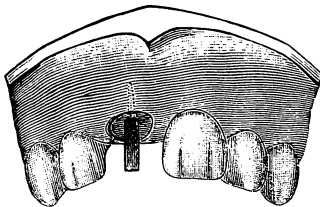


Fig. 167.

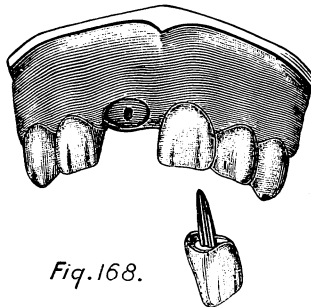


Fig. 168.

in the dowel, particularly in its lateral dimensions, affords opportunity for it to bend under stress in this direction, and thus admit of the displacement of the crown, which tendency or possibility may not always be overcome by the close approximation of the crown to the adjacent teeth.

In such cases, and especially where the latter is not possible, unless extreme care be taken, the employment of a crown possessing such

a dowel may be contraindicated, and the application of one with a more round and rigid dowel may be found more serviceable.

Application. In the application of the Logan crown the root should be prepared, a model secured, and the selection made in accordance with the previously mentioned requirements for this general style of crown.

A more accurate selection of the crown for the individual case may be greatly facilitated by preparing the canal after shaping the root, and then adjusting a temporary dowel of wood or metal, allowing it to pass well into the canal and to extend down to, or near, the incisal end of the adjacent teeth. (Fig. 167.) The end of an ordinary wooden toothpick will answer this purpose nicely, and when so adjusted, a modeling compound impression should be taken with it in position.

In removing the impression, the temporary dowel should remain firmly embedded in it, or be subsequently so placed, and the model made.

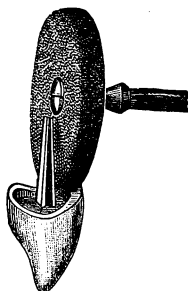


Fig. 169.

The removal of the dowel from the model will leave an outline of the canal, and indicate its size, and position, in relation to the root, all of which will be found decidedly convenient in, and advantageous to, the selection of the crown, because of the facility with which it may be readily adjusted to place. (Fig. 168.)

While the final adaptation of the crown should always be made directly upon the root, the above procedure will be found additionally advantageous if the impression is taken in plaster, and, after drying thoroughly, then filled with fusible alloy. This affords an accurate and comparatively indestructible model containing the outline of the base of the root, and a reproduction of the canal; and the crown may be selected, and primarily ground to a fairly accurate adjustment upon it, during the absence of the patient.

The grinding to the proper adaptation should be accomplished with

small flat-edge carborundum stones, in the engine, and care must be observed to avoid cutting into the dowel, or weakening its attachment to the porcelain. (Fig. 169.) The use of curved stones, suggested by Mr. Robert Brewster, will be subsequently mentioned, and may be found useful.

In the final adaptation of the crown, the use of small disks of carbon paper, perforated so as to slip over the dowel and rest against the base, with the carbon side placed next to the porcelain, will be found serviceable in securing a close approximation. (Fig. 170.)

In the use of such disks, as the crown is pressed to place, the points of contact between it and the root will be designated by a black mark on the porcelain, and the grinding at such points should be continued until the entire base thus indicates a uniform contact.

The requirements of peripheral approximation and occlusion should now be observed with care not to destroy the integrity between crown and dowel, and when the adaptation has been completed, any surfaces of the porcelain which have been ground, excepting the base, should



Fig. 170.

be nicely smoothed and polished with disks, and the crown then mounted.

Mounting.

While many methods of mounting this style of crown are advocated, and the subject in general will receive subsequent consideration, the permanency of the attachment by any method will, of course, depend much upon the accuracy of the adaptation. Where the joint is close enough to be rendered practically impervious, either cement or gutta percha may be used, as is the practice, and at the discretion of the operator.

The indications for the use of gutta percha increase, however, in proportion to the inaccuracy of the adaptation, and the two materials may be combined to advantage if desirable. In this procedure a disk of the ordinary pink base-plate gutta percha should be cut a trifle larger than the base of the crown, and then perforated to slip over the dowel. The latter should now be slightly roughened with a sharp instrument, and both it and the base of the crown then moistened with oil of cajuput, or any solvent, and the gutta percha disk adjusted to position.

It should then be placed on the electric gold annealer, or on a mica slab, over a flame, and slowly heated until the gutta percha becomes plastic, when, after moistening the root with water to prevent adhesion, the crown may be forced to place with enough pressure to mould the gutta percha to it, and to the root, and to fill the intervening space.

While the crown is now held firmly in place, the surplus should be trimmed away around the joint with a sharp, warm instrument, after which it should be removed and again placed upon the heating apparatus, until the root has been dried, and the base then moistened with the solvent, when it may be mounted with cement in the ordinary manner.

A similar procedure is indicated in the use of gutta percha alone, the details of which will be elsewhere considered at greater length.

With Band and Cap.

Several methods of employing the Logan crown in combination with a band and cap have been suggested as a means of obtaining greater permanency in their application; and when so adapted this or almost any of the various forms of such crowns possesses advantages which place them next in rank to porcelain work.

Such advantages constitute not only the increased integrity of the attachment, and preservation of the root, but include the esthetic possibilities which may be obtained in the translucent and natural appearance afforded by an all porcelain crown devoid of the presence of any backing.

Of the several methods advocated for so adapting this style of crown, a modification of the one devised by Dr. J. G. Hollingsworth will be found to be the most generally applicable and universally practicable.

This consists in preparing the root as previously indicated in connection with the "*band and dowel*" crown and the *Davis crown with a band*, and in fitting the band and constructing the finished cap *in the same manner as prescribed for the former*.

The crown should be selected in accordance with the details indicated, and this may be observed either before or after the adjustment of the cap. In grinding it to the proper adaptation, however, the cap should be laid aside, and the adjustment made directly to the root, in which procedure *the original form of the base of the crown is entirely changed*, and it is only necessary to observe accuracy along the labial edge. (Fig. 171, A.)

When a moderately accurate adaptation of this surface has been secured, together with an observation of the remaining requirements, the cap should be placed in position on the root, perforated to receive the dowel, and the *final adjustment then made with it in place*.

When the required adaptation has been thus obtained, the base of the crown should be further ground away on the *lingual* and *approximal* edges until an adequate V-shaped space exists between this portion of it and the cap. The space should be large enough to admit of being subsequently filled with solder, by which means the crown and cap are permanently attached, but should be no larger than necessary to facilitate this procedure, because of the possible weakening of the attachment of the dowel in the porcelain.

The perforation of the cap should be made with care to have the dowel *fit* closely into it, as a preservation of the accurate relation be-

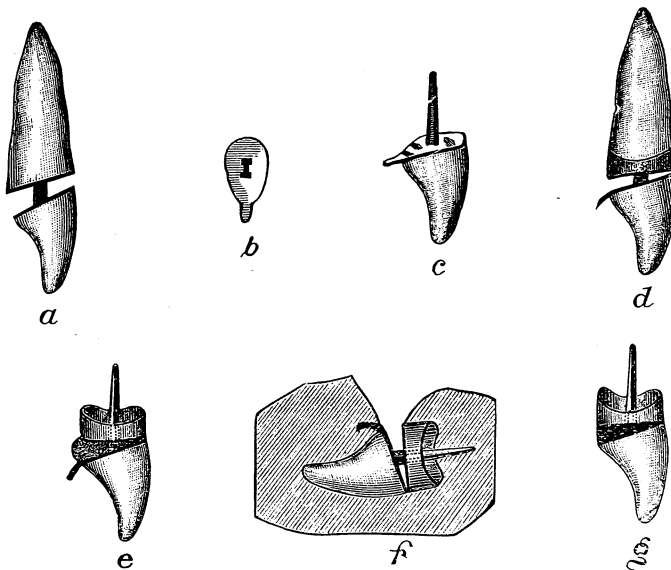


Fig. 171.

tween crown and cap, and the facility with which a strong union between them may be effected, will depend much upon such a relation. In the event of making too large a perforation, an additional disk of thin gold or platinum may be more accurately adjusted to the dowel, burnished to place on the cap, and separately soldered in its proper position, thus overcoming any possible difficulties in this connection.

The crown should now be backed up with a disk of *platinum*, about 36 gauge, which should be properly perforated, annealed, and closely burnished to place. In trimming it to follow the outlines of the base of the crown, a slight *lingual* extension (Fig. 171, B) should be allowed to remain, for the purpose of engaging in the investment material, and thus

retaining the backing in close proximity with the porcelain during the process of soldering. If this precaution is not observed, the backing will invariably be drawn away from the base of the crown, as a result of the shrinkage of the solder, thus diminishing the strength of the union, and affording an unhygienic joint.

A backing of pure gold might also be used instead of platinum, but the extreme thinness necessary to admit of carrying the porcelain well up to the gingival line would only introduce the possibility of fusing it during the process of filling this small space with solder.

When the backing has been adjusted, it should be attached in position on the crown with melted adhesive wax (Fig. 171, C), and the relation between crown and cap then secured on the root (Fig. 171, D), with the same material. To accomplish this with accuracy and facility, the cap should be placed in position on the root, kept perfectly dry, a little adhesive wax melted on the backing around the dowel, and the crown then quickly carried to place in its relation to the cap.

If the adhesive properties of the wax are not destroyed by the presence of moisture, and it is sufficiently heated to admit of the proper adjustment of the crown, the relation will be securely sustained, and crown and cap may be safely detached from the root with a small pointed excavator passed around the edge of the band.

The remaining space in the joint should then be completely filled with wax (Fig. 171, E), and the crown invested. Previous to investing, the lingual extension of the backing should be bent over *toward* the porcelain *without overlapping* upon it, until it may be so engaged in the investment material as to be held in place, yet offering no impediment to the soldering.

When the investment has crystallized, it should be trimmed down until as small as possible, to possess sufficient strength to hold the parts together. The wax should now be removed, and the joint between cap and backing then *freely exposed*, so as to admit of, and facilitate being filled flush with solder (Fig. 171, F.) The case should now be fluxed, heated thoroughly, and the space then filled with 18 karat solder.

In soldering such crowns, it must be remembered that the porcelain contains a large mass of platinum, hence it becomes necessary to first heat the porcelain well, in order to prevent the occurrence of a fracture.

In filling the joint, the solder should be cut in small pieces, and each one of these *consecutively applied and fused*, to assure its penetration to the full depth; and a *secure attachment to the dowel*, which, being covered with investment material, and being most remote from the exposed surfaces, is in consequence the most difficult to heat thoroughly.

This occasionally accounts for a failure to unite the crown to the cap, and in the event of such an accident their union may be subsequently effected by again investing, leaving only the *interior of the cap and the dowel exposed*, and attaching with a minimum of solder at the point of junction between the two.

The contouring of the solder to a flush smooth surface may be somewhat facilitated by cutting small triangular pieces of platinum or gold foil, or *thin plate*, and adapting them to the approximal sides of the wax in the joint, *before investing*, thus forming a matrix for the solder.

When the soldering has been completed and the cap becomes an integral part of the crown, it should be finished and polished as usual (Fig. 171, G), and then mounted.

Variation of Methods.

Several other methods of securing additional stability in the application of such crowns are employed, and at least two of them may often be used to advantage. These consist in *excising the original dowel* and replacing it with a *separate one*; and in *burnishing or swaging a thin plate to the basal end of the root* and attaching it to the crown and dowel, as a means of securing a more perfect adaptation without the use of a band.

Cases not infrequently present where it may be difficult to secure a proper adjustment of a *fixed-dowel crown*, because of the constricted size, or unfavorable location of the canal; or the position or shape of the root. In such instances the accomplishment of good results with the use of this style of crown may occasionally indicate, or even necessitate, the excision of the original dowel, and the employment of a separate one.

Substituting Separate Dowels.

When this procedure seems required, the cap should be constructed as usual, and an ordinary platino-iridium dowel fitted to the canal and soldered to it, allowing but a *short* projecting end to extend beyond the floor and toward the porcelain, so as to offer no, or a *minimum*, obstruction to the subsequent adjustment of the crown.

Procedure.

A suitable crown should be then selected and its dowel cut off at a point about $1/16$ of an inch from the base, when it may be ground to the proper adaptation, as further indicated in the preceding method. It should then be backed up in a similar manner, excepting that the backing may be trimmed to follow the entire outline of the base of the crown, and separately invested, so as to afford a *full exposure* of the surface of the backing (Fig. 172, A). When properly heated, this may be securely attached to the short projecting end of the dowel with solder.

The proper relation of the crown to the cap (Fig. 172, B) may now be secured and sustained with adhesive wax, and the parts removed, invested and soldered, as indicated. The finished crown is illustrated in Fig. 172, C.

As the degree of strength obtained in the union of the crown with the cap and dowel will depend much upon the length of the projecting end of each dowel, and naturally increase in proportion thereto, this procedure should be confined to extreme cases, or to those wherein the length of the crown may admit of a sufficient exposure of the ends of the dowels to insure a degree of integrity in the finished crown.

A method of securing increased accuracy in the adaptation of the crown to the root, which is applicable in many instances where it is not desirable to employ a band, was perhaps originally suggested by Dr. Gordon White, of Nashville, Tenn.

This consists in shaping the root, adapting the crown, and changing its original form, as previously outlined.

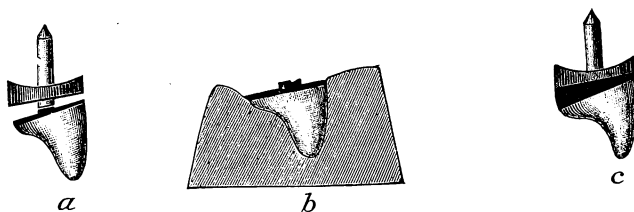


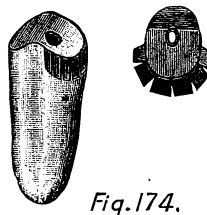
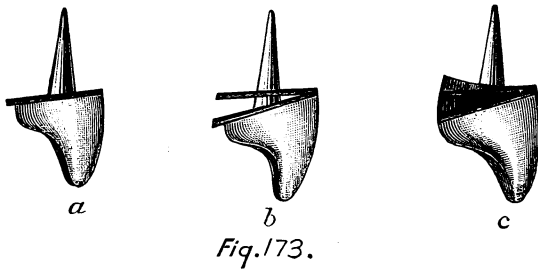
Fig. 172.

Procedure. In the procedure incident to the employment of this method, a disk of platinum foil, about No. 40 or 50, is annealed, perforated for the dowel, and burnished to a close adaptation to the base of the crown, after the latter has been properly ground, as indicated (Fig. 173, A). A second disk is then cut somewhat larger than necessary, to cover the end of the root, and closely adapted to it, thus forming a V-shaped space between the two surfaces of metal which is subsequently filled with solder, in the manner previously outlined. (Fig. 173, B.)

The first disk, which forms a backing for the crown, should have a slight lingual extension for the purpose of sustaining its close proximity with the porcelain while soldering; and the second disk, which is adapted to the base of the root, should possess a slight surplus on the lingual surface, which may be slit and burnished up over this portion of the root, thus resulting in the additional support of a partial band.

In securing a proper and close adaptation of each to their respective positions, the first disk should be placed in position on the crown, burnished, and trimmed, and then attached to the dowel with adhesive wax. A sufficient quantity of the latter to a little more than fill the space between crown and root should then be placed over this, and the second disk adjusted to position on the wax and attached by touching it with a hot instrument. The wax should then be chilled with cold water, the crown and disks placed in position on the root, and force enough applied with a piece of wood and small mallet to carry it well to place, which will *swage* the second disk to a close conformation with the base of the root, if enough wax is present.

The whole should then be removed and the surplus wax trimmed



down flush with the crown. The second disk may now be trimmed to closely follow the outline of the root, excepting upon the lingual, which portion may be slit, as suggested, and burnished up over this surface of the root upon the replacement of the crown. (Fig. 174.)

When this has been accomplished, it should be removed, and invested, and soldered, with an observation of the previously mentioned requirements and precautions in this connection, and the finished crown is illustrated in Fig. 173, C.

In roots possessing an irregular outline or concave base, this, or a similar, procedure may be found advantageous; and the disk which is

to be adapted to the root may be made of a heavier gauge of platinum when indicated, or desirable, in the manner previously recommended in connection with the "*plate and dowel crown*."

This procedure is also equally applicable to porcelain work, and when porcelain is preferable to the use of gold solder, for uniting the plate to the crown, the details differ only in dispensing with the *first* disk, as this is used simply as a backing for the crown, and no backing becomes necessary in porcelain work.

The adaptation of the disk to the base of the root, and the manner of obtaining and sustaining its relation to both the crown and root, may be accomplished as indicated, but the case should then be invested and the disk permanently attached to the dowel with pure gold, or twenty-five per cent platinum solder, before filling the intervening space with porcelain, as a means of precluding any possible change of relation which may accrue as a result of the shrinkage of the porcelain body in fusing.

The Brewster Crown.

Among the several other varieties of porcelain crown possessing fixed dowels, the Brewster crown, designed and manufactured by Mr. Robert Brewster, of Chicago, Ill., is more or less extensively employed.

It is made of porcelain body, quite similar to Ash's English teeth, in a good selection of moulds and colors, with a slightly concave base, and a *round* dowel. The latter is made of a composition metal similar to the alloy of German silver, and is attached to the crown with a low-fusing body. This enables it to possess the advantage of strength and rigidity, as well as economy, and yet the attachment between crown and dowel seems quite secure (Fig. 175, A).

The application of this crown may be made whenever the employment of a fixed dowel crown is indicated, or desirable; either with or without a band or plate; and the detail of procedure, in each instance, is identical with that indicated for the Logan crown, excepting that the composition of the dowel and its manner of attachment in the porcelain preclude its use in connection with porcelain work, where it is necessarily subjected to a high degree of heat in the furnace; though the same readily admit of the use of 20 karat solder.

The favorable shape of both crown and dowel, and the comparative ease with which it may be procured and adjusted, combined with its inexpensiveness, make it very useful for *temporary* purposes; but when employed as a permanent crown the dowel should be slightly flattened

on at least one side (or serrated), in order to facilitate the attachment of the cementing medium, and thus prevent possible rotation or loosening.

The adaptation of the base of the crown to the root may be accomplished with greater facility, and less danger of grinding the dowel, by the use of *curved* carborundum wheels, which are designed and recommended by Mr. Brewster for this purpose. (Fig. 175, B.)

The "Fellowship" Crown.

The "Fellowship" crown, devised and manufactured by the Dental Protective Supply Co., is constructed along lines similar to the preceding crown, and is also more or less extensively employed.

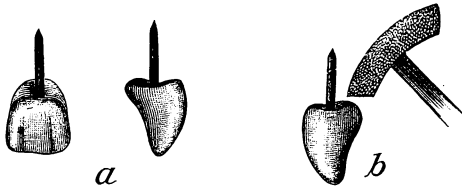


Fig. 175.

Any possible rotation of the crown on the dowel, or in its attachment to the root, is prevented by the shape of the dowel, and the manner in which it is attached to the porcelain. The shape, however, is similar to that of the dowel of the Logan crown, and in consequence possesses

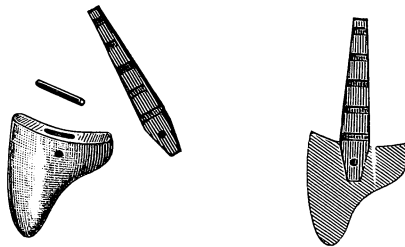


Fig. 176.

the same objectionable features. It is made of a German-silver alloy, and is attached in the crown by means of an additional piece of wire passing laterally through perforations in the base of the crown and end of the dowel, which are then subsequently filled flush with low-fusing body. (Fig. 176.)

Application.

The details of procedure in the application of this style of crown, and the indications for its employment are practically the same as those previously described.

Repairing.

In the event of the subsequent occurrence of a fracture of the porcelain in any of the various forms of fixed-dowel crowns, the method of repair is often difficult and sometimes even impossible; and the best results are usually accomplished by removing the remaining dowel and adapting a new crown.

When it has been mounted with cement, however, and particularly in small constricted roots, this is often a difficult and sometimes dangerous procedure; but may be accomplished by drilling out the cement immediately surrounding the dowel with a very small round bur until it may be gradually loosened and removed, in which extreme care must be exercised to prevent perforating the root or breaking off the dowel at a point which will likely preclude the removal of its apical end.

In very small roots or where either of the latter results seem at all probable, the method suggested by Dr. Joseph Head, of Philadelphia, may be employed to advantage. This consists in cutting the dowel into two lateral halves by drilling vertically through its smallest diameter with a small round bur, and when so divided, the space thus produced will admit of loosening each half until their separate removal may be effected without danger of weakening the root.

In those cases where the dowel remains firm in its attachment to the root, and the length and strength of its projecting end will afford adequate means of sustaining a new porcelain crown, it may often be left in place and a Davis crown adapted to the root and then cemented to it; or, a crown may be *constructed* possessing a *socket* in its base which will fit and engage the projecting end of the dowel and securely sustain it in its proper relation, when mounted with cement. As this latter procedure involves the construction of a crown which may often be found useful and practical it will be separately considered under the classification of *tube crowns*.

Tube Crowns.

This style of crown is adaptable to that class of cases previously referred to wherein the original has been broken away leaving the dowel still firm in its attachment to the root; and may be employed as a means of substituting a well adapted crown when, for any reason, it may not be deemed advisable, or desirable, to remove the remaining dowel.

The application of such a procedure and of the principles involved was probably first suggested by Dr. Wm. Mitchell, of London, England, but is also advocated and employed, as applied particularly to porcelain work, by Dr. Jas. E. Keefe, of Chicago, Ill., and Dr. F. J. Capon, of Toronto, Canada.

Application.

While the application of such crowns is necessarily confined to repair work, they are equally applicable to cases where the original crown possessed a band and cap, which may or may not remain securely in place, as well as to those where no band was used, so long as the dowel itself remains; but the strength in the attachment of the new crown will of course depend upon the length of the end of the dowel exposed and projecting beyond the surface of the cap, or root which may be telescoped by the tube.

When this is inadequate the opportunities for securing sufficient integrity may be increased by drilling out the cement around the dowel,

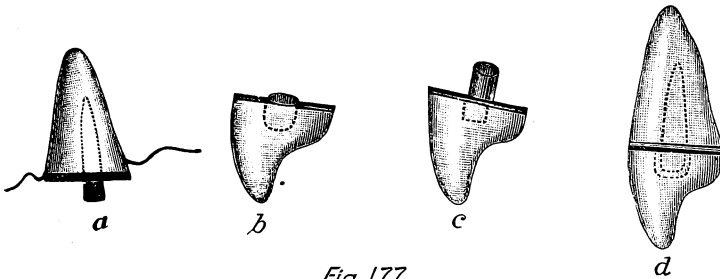


Fig. 177.

and thus trephining its end, with a small round bur, until a greater length is exposed; but where a cap remains, unless the dowel projects sufficiently far beyond it, such access and possibilities may indicate its destruction and removal.

When the dowel has been thus exposed so as to insure sufficient stability in the attachment of the crown, its end should be squared up and properly shaped to admit of, and facilitate, the adaptation and *easy removal* of a telescoping tube. (Fig. 177, a.)

Procedure.

This tube should be made of pure gold or platinum, about 36 gauge, and may be formed on a piece of wire previously selected for the purpose, and a trifle larger in diameter than the dowel; or *foil* may be used and adapted directly to the dowel, if subsequently reinforced with solder; which should be also observed even in the former.

When made and fitted, the joint should be soldered, and the tube then adjusted to the dowel. A disk of pure gold or platinum, as the requirements of the intended construction may indicate, about 36 gauge, should now be perforated to fit closely over the tube, burnished to a close adaptation to the root, and trimmed to follow its peripheal outline. The surplus end of the tube should now be cut off even with the end of the dowel, and the proper relation between it and the disk securely sustained with adhesive wax, when they may be detached from the root and invested and soldered, at which time the open end of the tube presenting toward the incisal edge should be closed. This affords an accurately adapted base for the subsequent construction of a crown in the ordinary manner, using a facing in combination with either gold or porcelain, which may then be finished and mounted with cement.

The completed crown for that class of cases where the end of the dowel projects far enough beyond the base of the root to afford adequate stability in the attachment is illustrated in Fig. 177, B; while the construction for those cases wherein the end of the dowel is trephined and the tube thus extended into the root, as a means of securing greater integrity, is illustrated in Fig. 177, C, and the relation of the finished crown to the root and dowel in the *former* class is illustrated in Fig. 177, D.

Temporary Crowns.

The employment of temporary crowns become necessary in *emergency* cases where *immediate* substitution of the lost natural, or broken artificial, crown is required; and is indicated in the construction of permanent crowns *for the anterior teeth*, for the purpose of relieving the patient of temporary disfigurement and embarassment during the procedure. Their use also materially facilitates the subsequent adjustment and mounting of the permanent crown by keeping the gum packed away and preserving a free exposure of the end of the root, during the interim.

Indications. In view of the possible advantages thus derived from their use in the application of dowel crowns, and particularly in the mouths of women, they should be invariably employed whenever the time required to complete the construction of a permanent crown precludes finishing and mounting the latter on the same day on which the root is prepared.

While almost any of the fixed-dowel crowns, and especially the less expensive ones, will often answer this purpose, and even the old-style English tube-teeth may be employed, the most simple, expeditious and inexpensive method consists in using an ordinary long-pin facing, and constructing the crown for the individual case.

Procedure. To facilitate the application, at least a small selection of facings for the six anterior teeth should be kept on hand. One suitable to the requirements of the case in size, shape and color, should then be selected and ground to a fairly good adaptation, and a dowel then made of German-silver wire. Such wire is convenient for many purposes and may be easily procured in six-inch lengths of various sizes from jewelers' supply houses. Fig. 178.

A proper length and size of dowel should be cut, one end slightly



Fig. 178.

tapered with a file, and the other flattened with a small hammer on the anvil, Fig. 179, or by pressing between rollers, Fig. 180, both of which are useful appurtenances for the well equipped laboratory, until it is broad enough to fit in snugly between the pins. This is done for the purpose of facilitating the attachment of the facing, and preventing any obstruction to the occlusion, but should not be done with a file, because

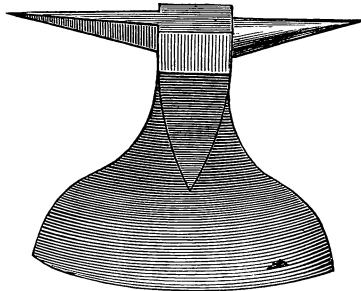


Fig. 179.

of thus unnecessarily diminishing the strength of the dowel at this point.

The most convenient method of attaching the facing and dowel has been suggested by Dr. W. H. Taggart, of Chicago, Ill. In this procedure the flattened end of the dowel is made somewhat broader than the space between the pins of the facing, and then *notched* with the edge of a file until it may be slipped into place, with the pins fitting closely into the notches. The permanent relation between the two may

then be securely sustained by simply bending the pins over upon the dowel.

The dowel should now be bent, if necessary, until the crown may be properly adjusted to position on the root, when it should be mounted with temporary stopping or gutta percha, with which the desired contouring of the lingual surface can also be made. The consecutive steps of this entire procedure are illustrated in Fig. 181.

Temporary stopping may be used with greater facility and possesses sufficient integrity to serve the purpose for a few days, but when the crown is to be worn for a longer, or more indefinite period, gutta percha should be used.

Although the detail incident to the construction of such crowns consumes but five or ten minutes' time, an assortment of these dowels

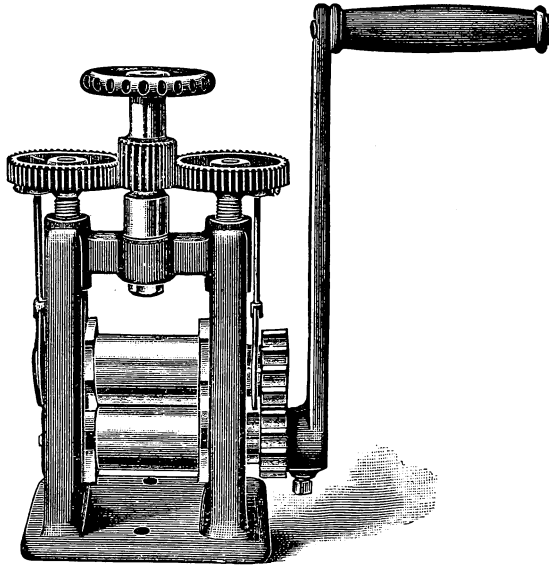


Fig. 180.

may be made at convenient opportunities, and kept for subsequent use, which will further expedite the work.

The relation between facing and dowel may be also sustained by the use of either *hard* or *soft* solder, if desirable, but a more secure attachment than is afforded by the above method is seldom, if ever, required.

In the use of gold or silver solder for such purposes the facing and dowel should be attached by bending the pins, and the whole then in-

vested and soldered in the usual manner. In using soft solder, however, no investment is necessary if the facing and dowel are placed upon a slightly heated charcoal or asbestos block or in a bed of asbestos fibre; the proper flux then applied, and evaporated with heat, and the solder then fused by slowly directing the flame of a Bunsen burner or alcohol lamp upon the facing.

A more artistic and finished contour of the lingual surface, as well as a more permanent adaptation of such crowns may be obtained by placing the facing and dowel (after their attachment) upon the root, and packing plastic amalgam over its end, and around the dowel, to the desired contour.

Use of Amalgam.

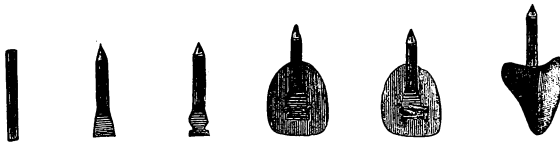


Fig. 181.

After this has crystallized, it may be finished and polished, and then mounted, as indicated. Such a procedure, however, consumes more time, and entails more work than is usually indicated or warrantable for *temporary* purposes.

More artistic and permanent results may also be obtained by adapting the base and forming the lingual contour with wax, and subsequently flasking the crown and replacing the wax with vulcanite. In the process, however, it becomes necessary to "*tin*" the German-silver dowel, so that the vulcanite may become attached to it, and the entire procedure requires more time than that incident to the construction of a crown in a more practical and artistic manner.





The Chemistry of Oxyphosphates.

By HERMAN FLECK, Ph.D., University of Pennsylvania and University of Tübingen,
Wuerttemberg, Germany, Denver, Colo.

Read before the Colorado State Dental Society, June, 1902.

It is not necessary in order to bring dentistry to the point at which it overlaps chemical science to call attention, except in brief, to the fact that nearly every substance that is used in the profession, as adjunct to the mechanical feature of dentistry, has a chemical theory to begin with, a practical chemical application to proceed with, and a complete chemical evolution to bring it to perfection.

As dentistry now stands the fields of inorganic and organic chemistry have been liberally drawn upon, and as progress is made in the former, new uses will be found in the latter.

If all the chemical data that have been useful in the progress of dentistry were gathered together, a foundation for a department of dental chemistry would become apparent at once. However, as matters stand, the requirements in one or two fields so outweigh those in others, that certain few phases, notably the subject under consideration, stand out by themselves with such prominence that they seem to constitute the entire field.

Greater necessities in a few directions have demanded this one-sidedness, though the field is open for fruitful research in many others.

To the dentist in general, the chemistry of dentistry, except the usual course in the college curriculum, is a sealed book; and for very good reasons. On the one hand the field has not warranted a course that would mould either dentist or chemist into a student whose preparation should be analogous to the physiological chemist. On the other hand this only practical source of information having been excluded, facts, never revealed to light, lie in the hands of manufacturers who, standing aloof from all but the general ideas of those whose demands created them, jealously guard their discoveries, yea, even the ground-work thereof, for commercial reasons.

In this novel position,—between the scientist who dictates his ideas and the manufacturer who carries them out,—the dentist knows but very little about the substances which he uses, and he accepts them without eagerness or protest; and unless the chemistry of his purchase be of the 14th century brand, his judgment will lead to suspicion only. I believe there is no other profession so placed.

The vagueness and mystery surrounding the products which the dentist uses, often enhanced by most confusing advertising gymnastics, are not a tempting barrier, with ever so fruitful a field behind it. It is a mistake, in my opinion, from both scientific and commercial standpoint, to withhold enlightenment, and it is equally difficult to conceive any but good results by closer communion between dentist and manufacturer.

Historical. About 1850 the first osteo-plastic was introduced in the form of an oxychloride which, for many reasons, proved inadequate. Then followed an improvement on this idea, in a cement made by mixing zinc oxide (form undetermined) with glacial or metaphosphoric acid. From this point scattered publications give ideas of evolutionary stages up to the present time, with occasional rumors of ideals discovered from time to time, but kept secret by their discoverers. It is inferred that when their formulæ died with the owners the profession suffered greatly. Indeed, based on these probably groundless rumors, a cement was recently prepared with an alleged formula of that used by Rostangue. The claim made was, that former patients were deprived of their cement fillings, which were then analyzed.*

An analysis and synthesis of nearly every cement on the market up to the present time serves a better purpose than the published history. The tale unfolded, necessarily without dates and performers, is briefly this:

From zinc oxychloride, which was too easily disintegrated by organic matter, to zinc oxy-metaphosphate was an easy stage. How long cements might have lasted in the latter stage is a matter of conjecture. That, as is popularly supposed, developments in oxyphosphates were the result of progressive research is denied by the fact that progress has been slow, but principally by the fact that there are still to be found on the market and in dentists' offices, cements of this ancient type. It is my opinion that the chemical freakiness of metaphosphoric acid was responsible for its downfall; for while in later days better

*Common sense threw a doubt on this and an analysis verified the doubt. The analysis revealed an ordinary type of cement which could not have lasted for so long a period even under the most favorable conditions.

grades are manufactured, metaphosphoric acid of variable composition has been made, and is still made for the market. In the first place, anywhere from ten to thirty per cent of sodium metaphosphate is present. This substance is removed only with great difficulty. Secondly, it is a chemical fact that metaphosphoric acid dissolved in water changes to ordinary or orthophosphoric acid, and the simple experiment of treating zinc oxide with sixty per cent orthophosphoric acid will demonstrate that the heat developed in the operator who used an altered cement of this kind was considerably greater than that which formed an instantly setting, crumbling mass.

When the percentage of sodium metaphosphate, as variable impurity, ran high, danger from formation of orthophosphoric acid was not so much to be feared because this salt is a modifier of pronounced type. But with so many uncertainties it is small wonder that the next type of cement quickly followed.

Bound by laws of adaptation, the manufacturer accepted the idea that had been a bugbear to him, and, starting with orthophosphoric acid, a product unaltered by water and capable of being obtained in pure state, he modified it with the same substance that had, in an erratic fashion, modified it previously; namely, sodium phosphate. Now his products were under his control and the basis of the modern cement was complete. There are still today so many of this type extant that it becomes necessary to divide cements into two classes, according to kind of modifier used.

Classification. An oxyphosphate consists of two parts; powder and liquid. Naturally each will vary from period to period. But until the entire nature of this type of plastics changes, there will be only one kind of liquid used, however modified, and that is phosphoric acid. Hence classification must be based, at present, on the liquid. The classes, two in number, are formed according to their modifiers.

A word or two in regard to the action of the modifier: It has been mentioned that when orthophosphoric acid is mixed with zinc oxide a rather violent reaction takes place; the mass becomes intensely hot, and a brittle product is the almost instant result. A reaction so far beyond control must needs be modified. A little study of the acid will show that it has three atoms of hydrogen, acid in nature and capable of replacement by nearly all metals in rapid or slow succession, or what is the same thing, in continued or interrupted stages. With possibly the exception of the oxyphosphate of copper, only the latter kind of reaction concerns us.

At first the reason for the modified action of the liquid is not clear

on account of the apparent little difference between a continuous action between zinc oxide and phosphoric acid and what may be termed an interrupted action—i. e., separate treatment of the acid with oxide and subsequent mixing with more oxide. Chemically, however, there exists a great difference. Avoiding, for the sake of simplicity, deep seated play of atoms and molecules, the possible reasons are the following:

When zinc oxide is mixed to completion with phosphoric acid, compounds result called acid phosphates, which *in status nascendi*, combine more vigorously with more oxide; whereas, when a portion of the oxide is first dissolved in the acid by the aid of heat, the liquid which results also contains acid phosphates, but these no longer existing in the nascent state, their activity is lost and a less violent reaction results. This may be supplemented by another reason:

Phosphoric acid having three acid, hence three replaceable hydrogen atoms, the union between zinc oxide and phosphoric acid takes place in at least three stages. Now when these three stages proceed simultaneously there is liberated in each stage a certain amount of heat, the cumulative effect of which is to hasten the reaction to an unmanageable point. But with one or two of the stages conducted separately, and the third or final stage conducted after the heat of the first stages has been liberated, a more even reaction and uniform product are the results.

So little work has been done on the chemical composition, much less the special structure, of so-called oxyphosphates, that equations representing the above would be mere conjecture. In the demonstration which follows no attempt at positive assertion is intended.

**What is an
Acid Phosphate?**

Since they play such an important role at least brief attention to them is desirable. It is stated above that phosphoric acid contains three acid or replaceable hydrogen atoms. Let them be represented by the three letters H in the symbol—



and let M stand for any metal of the same power of combination as H. Then by successive replacement of hydrogen atoms by metal there result



One and two are acid phosphate still active toward metals and metallic oxides, whereas three is neutral or saturated phosphate, which is no longer active. Precisely similar substances are formed when zinc oxide and some forms of aluminum oxide react with phosphoric acid, the

metal replacing hydrogen, which in turn forms water with the oxygen of the oxide used. Either types one or two or both, are present in the liquid and three forms the basis of the finished and set cement. Where both zinc and alumina are dissolved in the liquid, mixed types result.* The water which results is partly or wholly recombined to form an oxyphosphate, and as all cements lose water after mixing, it may be asserted that more water than is necessary to form a complete combination has been used. This suggests another point of significance which will be discussed under solubility. Certain physical conditions are required in the mixing of a cement. For instance, it is necessary for some purposes to mix to a viscous consistency only; for others, especially where more rapid setting is required, together with greater crushing strength, a putty like consistency is required. Now, is there any free zinc oxide or uncombined oxide present in the finished and set mass, or does it all, together with some water and the available phosphoric acid, combine to the form of oxyphosphate? The following experiment demonstrates that much more is used than is required to form a neutral phosphate (type 3) and, that granted that a certain amount unites to form a looser combination, there still remains an excess.

Cement used was of modern type—mixed to
Experiment. putty consistency.

Liquid used2.15 grams.

Powder used (zinc oxide).....4.6 grams.

2.15 grams of liquid contained 1.0943 grams available or active phosphoric acid.

1.0943 grams phosphoric acid required by calculation 1.356 grams zinc oxide for neutralization.

4.6 grams zinc oxide used minus 1.356 grams required equals 3.244 grams zinc oxide. Therefore about two and two-fifths ($2 \frac{2}{5}$) times more zinc oxide was used than was required for exact neutralization.

Considering a phosphate which contains more than one metal, a double phosphate, etc., a modern cement may fairly be said to be—a simple, or double, and sometimes triple oxyphosphate—containing excessive water and excessive zinc oxide, *per se* or with magnesia, tin oxide, silica, etc.—obtained by mixing zinc oxide with dilute orthophosphoric acid in which acid phosphates are dissolved. When the acid phosphates are those of the alkaline metals, sodium and potassium, cements of the first class are the result. When the acid phosphates present are those of zinc and aluminium, cements of the second class result.

*When the powder to be added is not simple zinc oxide, but contains magnesia, tin oxide, silica, alumina, lime, etc., substances of more complex nature are formed.

Summing Up. Class I consists of cements resulting from a mixture of some form of zinc oxide with orthophosphoric acid that has been modified with alkaline

phosphates or borax.

Class II consists of cements resulting from a mixture of some form of zinc oxide *per se*; zinc oxide bound to or admixed with tin oxides, silica or magnesia, or any two of these or all three; or with alumina *per se*, or alumina bound to or admixed with lime or silica or both, *with* orthophosphoric acid that has been modified with zinc phosphate or aluminium phosphate or both.

Cements of Class I are practically worthless. At times their liquids contain boric acid in large quantity. In such cases sodium phosphate is an invariable accompaniment, leading to the conclusion that borax has been added. No benefit results. As an antiseptic the resulting boric acid is perhaps inferior to the zinc salts present and both boric acid and sodium phosphate are soluble in water, rendering a cement containing them subject to disintegration by the oral fluids. When, on the other hand, acid phosphates such as exist in the liquids of the second class have reached complete chemical union with their powders, there results the maximum insolubility ever to be hoped for in plastics of the phosphate type.

The Powder. The tremendous influence exerted by the kind, quality and degree of fineness of a cement powder opens at once a chapter of considerable proportions.

Under the head of "kind" must be taken into consideration: chemical composition, qualitative and quantitative; under the head of quality: purity (freedom from discoloring and injurious materials) and density or specific gravity, which, together with the degree of fineness, determines very largely the properties which a cement should or should not possess.

Cement powders may contain, in addition to zinc oxide, tin oxide, silica, magnesia, alumina and lime; impurities: arsenic, iron oxide, cadmium oxide; as pigments: carbon, manganese oxide, chromium oxide, iron oxide, chromates of barium and potassium, ultramarine, cobalt glass and others.

The chemistry of each of these and their proportions is matter for some future text book.

Zinc oxide of commerce is the basis of cement powders. By a process of purification the zinc carbonate formed is calcined to a light oxide. So prepared, the material is entirely unsuitable for plastic purposes, possessing great shrinkage, developing much heat and setting far too rapidly with even highly modified liquids.

The mooted question of the presence of arsenic, undoubtedly brought into prominence by alarmist advertising, need not be considered here.*

Density is the factor missing. The required conditions are reached by treatment with nitric acid, evaporating and subsequent calcining in suitable vessels; by fusion with certain fluxes, like borax, and subsequent solution of the flux; by fusion of zinc sulphate with sodium sulphate and subsequent lixiviation; and by prolonged calcining at very high heat in specially constructed furnaces. By these processes the specific gravity of zinc oxide rises from 5.42 to 6.2 and the solubility in acid is vastly decreased.

Oxide of tin results when tin and some of its salts are heated. It is a very dense white powder and is practically inert toward phosphoric acid. It has found only limited use as a body diluent. Silica may be used in the form of precipitated, finely divided silicic acid, or in the form of powdered quartz. It is inert toward phosphoric acid and takes no part in the reaction between powder and liquid. Diluents of this nature modify the heat of reaction but lessen neutralizing power and when present, either prolong the final chemical union or prevent it entirely. Magnesium and lime are used in many of the commercial forms, and like the zinc oxide, become denser on calcining.

Alumina in its light form, as obtained by calcining its hydrate, is very reactive, but prolonged heating at a low temperature or a limited heating at a high temperature destroys this reactivity almost wholly. Where calcined, therefore, it is necessary to add a substance which will render it reactive again after calcining is complete. Lime fulfils this purpose, a calcium aluminate resulting.

Usually the constituents of a powder are mixed in their light form and are then calcined until correct results are obtained.

Purity is demanded principally for the purpose of maintaining constancy in results. The presence of a minute quantity of a carbonate, a quite possible impurity, is absolutely ruinous to any cement, for instance. Iron oxide in variable quantities produces different shades of yellow and eventually, when placed in the mouth, is subject to discoloration, due to formation of dark sulphide.

The degree of fineness of the powder is very important. To begin with, a coarse powder may or may not be suitable for inlay work or crown or bridge work, whereas it may suit very well for a plastic filling. When the coarse grains consist of a substance easily reduced, rounded and adapted, like zinc oxide, lime or magnesia, no harm can result. But

*Dr. Ames, of Chicago, has proved its harmlessness by actual physiological experiment. His conclusions that arsenic is bound to zinc as zinc arsenite in the process of calcining, and that the latter, unlike arsenic, is harmless, has a clear ring.

points of contact may be very irregular when the coarse grains consist of inert crystals of alumina or slivers of crushed quartz. Coarse powders set more slowly with the liquid than fine powders and are hence a longer time in "aging," thereby exposing the cement to the attack of oral fluids and to other disturbances. On the other hand, they are less subject to contraction and can resist great pressure when thoroughly set. Vice versa a fine powder is more rapidly reacted upon, sets more quickly, resists oral fluids sooner, is less likely to attack tooth structure by a prolonged period of acidity before neutralization. A fine bit of judgment is required to find the proper balance.

Common sense dictates that a cement prepared
The Liquid. with uniform liquid should give uniform results, and vice versa, to give uniform results a liquid should be

kept absolutely uniform. When, therefore, a liquid contains a deposition of crystals, unless these be redissolved a result not intended originally is assured. Again, whenever a cement liquid is allowed to flow over a crust of material deposited on the neck of a container, it is almost sure to alter its composition by taking some of it into solution. Furthermore, metal caps are entirely out of place. Containing tin, zinc and lead in many cases, they are corroded and in turn contaminate the liquid under them. By this means not alone is the composition of the liquid altered, but a cement made from it now contains a metallic phosphate which will blacken when exposed to products of decomposition containing sulphides. These are some of the things which stand in the way of good results. To return to normal conditions:

The cement liquid of today has part of the reaction, which goes to form a plastic, completed within it. They are of all degrees of viscosity, depending upon the extent to which they have been modified, and this in turn depends upon the kind of powder chosen to unite with it; the less active the powder the less need for strong modification; the more active the powder the more need for modification. As a rule, however, the more viscous the liquid the slower the setting and the longer the period of neutralization. This applies almost entirely to cements whose powders contain zinc oxides.

Of other kinds at present known it is an invariable rule that even with slightly modified liquids the point of complete neutralization is never reached, although the period of hardening may be very brief.

Crystallization in the same liquid may or may not take place in the same time, or at all. Viscous cement liquids may be likened unto the well known organic substances, glycerine and glucose. They may crystallize suddenly without any visible cause, or may be brought to crystallization by the introduction of an already formed crystal, by a particle of

dust or grit, or by agitation. Low temperature also is a factor which favors crystallization. The crystals formed in cement liquids are highly acid phosphates of zinc or alumina or both. In rare cases a paste like form appears and then it is highly likely that the product is a cement of Class I, and that the paste contains crystals of boric acid. In any case crystal formation is a fault and should be avoided. Liquids which crystallize may be said to be supercharged. Suspended matter is different and, as a rule, offers no objectionable feature, except in supercharged liquids. A little flocculent matter usually means that the phosphoric acid used contained a trace of silica, which was precipitated upon dilution. Many of the liquids analyzed showed traces of iron, lime and magnesia. These are also present in some grades of phosphoric acid and, with the possible exception of iron, create no material defect. Different, however, are the cases where analysis of liquids exposed as high as ten per cent of sodium and potassium phosphate. It is reasonable to suppose from the presence of zinc and alumina modifiers in these that they were intended for liquids of Class II, and that the alkaline phosphates were there as impurities.

The Mix. For convenience, in every phase of the cement question, it is well to divide the setting of a cement into three stages:

I.—*The fluid stage*, which embraces mixing and a chemical union very gradual at first proceeding to a point when the mass may be worked in the fingers.

II.—*The plastic stage*, beginning at an undefined point and lasting until the mass becomes hard to hand pressure. Heat is generated to a greater or less degree in this stage, which varies from a few seconds to one-half hour or more.

III.—*The setting stage*, beginning at a point where change from liquid to solid condition prevents as rapid chemical play as in the previous stages. All heat is dissipated shortly after this period begins and chemical union or complete chemical neutralization takes place; in other words, the point at which, under ideal conditions, *synthesis is complete and analysis begins*.

This stage defines the popular term "aging." All the properties of a cement will have been fully developed at its completion. It varies from twenty-four hours, to an indefinite time in several oxyphosphates containing no zinc.

There is perhaps no greater paradox in nature than the fact that the spirit that prompts a discovery is the same that delays its prompt acceptance. It is human nature not to follow directions. A malicious spirit of independent research breeds contempt for such crea-

tions. Nevertheless, experience is the best director where patience and capacity to record are plentiful.

Having created a perfectly balanced cement everything now depends upon how the mix is made. A universal question is: Isn't the mix of great importance? I have never heard this satisfactorily answered and, in fact, do not know that it can be. However, a sketch of what really takes place may serve as a guide in the one great point leading to success—a study of each cement in mixing for the best result.

For the sake of simplicity the simplest, although practically an impossible form of a cement will be taken—a plain acid for the liquid and a plain zinc oxide for the powder.

Suppose that the powder be added with regularity in pin head quantities over a period of several hours. Then the first pinch of powder will dissolve, under manipulation, producing in reality a liquid more highly modified, perhaps slightly concentrated too by evaporation and with a temperature of the surrounding atmosphere. Another pinch is added and another until the acid is completely charged with acid phosphate, when the next pinch refuses to dissolve. Already a point is reached where plasticity will begin in earnest and the zinc oxide is creeping beyond the quantity theoretically demanded by the available acid present. Finally the proper consistency is produced, proportionately less oxide of zinc having been consumed out of the final pinches as a point nearer neutralization is reached. . . . Then imagine the same quantity of liquid and powder that were previously used, instantly mixed. In a twinkling the first pinch has seized its allotted portion of the acid, has united with it like a flash, generating heat, which communicated to adjoining liquid and powder alike, increases its power of activity thereby, and so on until, in a few seconds, a stage is reached corresponding to the extreme sluggishness in the last hour or so of the previous example; but far different from it there is no suspension of action for a moment, the heat produced by larger pinches, accumulating instead of dissipating, until complete chemical action and therefore "aging" is completed instantly. From the same substances a slow and a rapid setter have been produced with different periods of "aging," hence neutralization. And these, as well as all possible intermediate products, depend upon the time of manipulation chiefly, but also upon the regularity of powder addition; and furthermore each has its own peculiarities. They will show marked differences in porosity, imperviousness, solubility, crushing strength, adhesiveness, expansion and contraction, and resistance to abrasion.

Impermeability.

The term impermeability applied to cements is self-explanatory.

The agents to be considered are capillary attraction, diffusion and solution—physical agencies aided by the chemical nature of cements and oral fluids.

Porosity implies absorption of liquids by capillary attraction in an insufficiently dense mass. Such a mass is produced in quick setting cements of the old type, in cements whose liquids have been insufficiently modified or whose powders do not possess a sufficient degree of density. The product obtained by the action of zinc oxide in sixty per cent orthophosphoric acid is an excellent example. It is strictly porous, clings to the tongue and when immersed in dye solution is quickly stained. Carbonates, when present even in traces, enhance porosity.

Porosity may ensue when conditions are ripe for diffusion and solution, in which case the final result is the same. Here the term applies to cements of the first and second classes. The cement is modified by means of phosphate of soda, borax, boric acid; or other water soluble materials such as alkaline phosphates have found their way into the liquid or powder as impurities. Then penetration will take place more slowly, but penetration will follow because the mass will eventually become porous by the action of solvents upon soluble constituents. In the latter case the result is perhaps worse than in the former, because the remaining structure will be weaker. In the case of many slow setting cements of Class II, the effect will be very much the same. To illustrate: An example may be found in a cement, the liquid and powder of which were such that when thoroughly combined, away from contact with aqueous fluids, a fairly impervious mass was produced. Yet the liquid was so highly charged with acid phosphates that many hours were required for final combination. Here it is evident that the excess of mineral constituent, i. e., acid phosphate, existing as it does in aqueous phosphoric acid solution, is capable of mixing with more aqueous solution. Therefore this soluble acid phosphate, unless immediately bound and neutralized by the substances contained in the powder, will exist in its original form, or something like it, in the plastic filling, and will therefore be capable of mixing with or absorbing aqueous oral fluids, or what is worse, of washing out as long as there is any uncombined matter remaining. This will be during the entire period of setting. That is to say, that since acid phosphates are soluble in water and since acid phosphates are present in a cement until the third stage of setting is complete, permeability from this source must necessarily follow to a greater or less degree. How far penetration will pro-

ceed depends upon the time required for complete chemical combination of the substances in the remaining mass.

Two remaining causes for permeability deserve mention here. One concerns the degree of fineness of the powder and the other concerns the water which remains uncombined.

One of the differences observed in the use of fine and coarse oxides is the time required for setting. An impalpable powder will combine more quickly than a medium fine powder, and the latter will combine more quickly than a coarse powder. Now it seems that time of combination influences solubility and diffusion, which are two causes of permeability, and where no attempt has been made to furnish the consumer with a standard degree of fineness, varying results are inevitable.

Secondly.—What becomes of the uncombined water in the finished product? Surely it cannot evaporate in the mouth—though were this possible, what would take place in the space previously occupied by it? Since the results in both cases would be alike and since the first is the only possibility, it alone may be discussed. A porous body absorbs aqueous fluids according to the size of its interstices, and when saturated can no longer be said to be porous. This does not, however, make it impervious, because aqueous fluids of different kinds are capable of diffusing through it and a solution of dye will in time color the mass. The larger the interstices and the greater the number the more the substance will be penetrated. Now a cement containing uncombined water is more or less a porous body with water chambers enclosed. A large quantity of water will influence imperviousness more than a smaller quantity. How far this influences the various known cements is hard to decide because the methods which are available are influenced very largely by other factors, such as porosity, soluble alkaline salts, excessive acid phosphates, etc.

The proposition is, however, so self evident that
Experiments. a series of experiments, under analogous conditions, was conducted to determine the quantity of water remaining uncombined. The conditions were as follows: The cement in each case was mixed to a thick paste and allowed to stand in form of a pea sized pellet for 15 hours (no account of the water lost during this period was taken). It was then weighed and allowed to stand for twenty-four hours and reweighed. The loss is calculated in per cent. The pellet was then crushed and ground to a fine powder after which it was again weighed. The powder so obtained was dried to constant weight at 110° C. (no loss of combined water could occur at this temperature.) (See note, p. 918.) The loss of weight sustained by the powder calculated in per cent, plus the loss in per cent sustained by the pellet, represents the

total quantity of water remaining in the cement after an allowance of fifteen hours.

Cement.	Loss in 24 hours.	Loss at 110° C.	Total water.
	Per cent.	Per cent.	Per cent.
A	1.00	5.8	6.8
C	.17	12.1	12.27
D	.8	5.1	5.9
E	.17	6.4	7.9
F	.63	4.7	5.33
G	2.2	10.4	12.6
H	.4	5.22	5.62
I	.53	6.1	6.63
J	.43	4.3	4.73
K	.00	3.6	3.6
L	4.3	3.5	7.8
N	1.1	2.6	3.7
O	.89	3.6	4.49
P	2.4	3.0	5.4
Q	.....	3.3	.....

B and M were not subjected to this treatment and are therefore not in the list. Their respective letters will, however, for future convenience be retained.

These figures represent minimum losses, for no account was taken of the loss during the first fifteen hours—a sufficient time for a fair degree of stability to have been established. A few experiments of the following nature established an additional average loss of 1.7 per cent:

Freshly prepared pellets were immediately placed in stoppered vials and were then weighed when all heat of reaction had dissipated. The pellets were then exposed for twenty-four hours and reweighed. The difference between the percentage of loss so obtained and the above twenty-four hour percentage represents the loss during the first fifteen hours. Nearly fifteen per cent of water uncombined after twenty-four hours! Certainly such a factor plays a great part for the worse in a cement. Unfortunately there is no test of sufficient delicacy to determine the extent of shortcomings due to this cause, in the presence of certain other factors.

A to H inclusive belong to the second class and the remainder consists of cements of the first class.

It is observed of the second class that, with the exception of C and G, the results run fairly even. C and G were of the kind whose liquids are supercharged with acid phosphate—both containing heavy deposits of crystals. They both set very slowly, and this explains the high figures obtained. The water present in them did not combine as readily as in the others, in the allotted time, and though held tenaciously by deliquescent acid phosphates, was liberated on drying to the extent of 12.1 and 10.4 per cent respectively.

As a matter of fact these two showed permeability when placed

By combined water is meant that which has entered into chemical action (union) to form oxyphosphate. Such water is not easily driven off.

in dye for twenty-four hours, after remaining in the open air for six hours and seven and one-half hours respectively. The remainder of this class, under the same conditions, showed little or no permeability.*

Every cement at some time is in the condition in which C and G were found to be after six hours, that is, with free acid phosphates and with much uncombined water in the mass. This condition may last but a few minutes, or extend over an indefinite period. Until this condition is changed by proper interaction of the ingredients, penetration will follow for the reasons set forth.**

A word about the method employed in testing permeability:

**Tests with
Dyes.**

The generally employed dye and ink test is common in several fields. It is true that where no molecules exist in a mass of matter, molecules of a dye stuff dissolved in a menstruum can be filled in by pressure or capillary attraction. It is equally true that the same kinds of molecules will replace other molecules, which, however, must first be removed by some agency, as diffusion or solution; but the salient points to be observed here are:

First.—The dye must undergo no chemical alteration during the process.

Second.—Conditions of the test must be as nearly alike as possible to those, to prove the effect of which the test is to be conducted.

It is necessary to examine a little into the properties of dye stuffs in order to avoid misleading complications.

Organic dyes frequently occur on the market as very weak salts of alkaline metals. When these salts are dissolved in water or alcohol a dye solution results. Acids, when added to the solutions of some of these dyes, instantly separate them as free bases from the solution, leaving the solution colorless—the acid having taken unto itself the alkaline metal from the weak solution. Of what avail is it to use dyes and inks of this sort? The acid surface of the pellet merely serves as a filter bed, separating solid from liquid and perhaps allowing the latter to go through undetected or to clog up the surface pores with precipitated dye stuff. These dyes are often technically treated with salts of alumina, etc., whereby a colored precipitate is formed which contains alumina, etc., the resulting product forming a “lake.” Lakes are used as pigments in lithographing. *Acid phosphates, such as occur in cement liquids or in the partially set mix, are capable of forming these lakes.*

*The members of the first class, containing under all conditions soluble material, furnish unsatisfactory data. The results are interesting, nevertheless, when viewed *per se*.

**The destructive influence of these acid phosphates on the tooth structure is a matter which I reserve for further research. That they decompose carbonates is a known fact.

The result is the same as above. Hence it follows that dyes of the above nature, while they may under rare conditions show correct results, are usually worthless for the purpose, due to alteration of the dye. Especially to be avoided are all fluorescein derivatives, such as eosin, fluorescein, carmine inks, etc., now so popularly in use for this test.

To be recommended are rosanilin (red), phenylene braun (brown), picric acid (yellow), alkali green (green), methyl violet (blue). When these are not accessible, test the dye stuff to be used for suitability by dissolving a few flakes or grains in clear water and adding a drop or two of liquid from the cement package. If a heavy sediment of coloring matter appears the dye must be rejected.

Aqueous and not alcoholic dyes should be used. Alcohol is not a constant constituent of the oral fluids and behaves toward oxyphosphates in a manner quite different from water. Some oxyphosphates will resist the inroads of water to a marked degree by uniting chemically with it, swelling up at the surface, as it were, by reason of this combination, thereby performing a more or less perfect caulking action. Cements of this kind need no doubtful protection by wax, varnish or paraffin.

Solubility. The destructive influences which solubility exerts on every good quality possessed by a cement, naturally connects the various subjects so closely that in order to do full justice, repetition becomes a matter of necessity. When solubility exists there must be solvents, and substances capable of solution. In order to take up the subject intelligently it becomes necessary to know something of each.

A general classification of the compounds present in cements when completely set may be gathered from the foregoing. They are:

- A { Zinc oxide.
Aluminium oxide.
Silica.
Tin oxide.
Boric acid.
Sodium phosphate.
Potassium phosphate.

This includes the substances which form the greater part of the mass and which are in the matter in excess of that required by the acid present—estimated on page 910 to be two and two-fifths excess.

- B { Zinc oxyphosphate proper.
Aluminium phosphate.
Lime phosphate.
Magnesium phosphate.
Sodium phosphate.
Potassium phosphate.
Any mixed phosphate resulting by the interaction of any of the above constituents.

In addition to these we have in a cement that is not set:

C	Zinc acid phosphates.	
	Aluminium acid phosphates.	
	Lime acid phosphates.	
	Magnesium acid phosphates.	
	Sodium acid phosphates.	
	Potassium acid phosphates.	
	Any mixed acid phosphates resulting from interaction of any of the above constituents.*	

Mixed saliva, the solvent, consists principally of water. A representative analysis is the following: (Simon's Clinical Diagnosis).

Water	995.2 parts by weight in 1,000
Ptyalin	1.34 "
Mucin	1.62 " " "
Epithelium	" " "
Fatty matter	" " "
Sulphocyanides .....	.06 " " "
Chlorides of the alkali metals .....	.84 " " "
Di-sodium phosphate .....	.94 " " "
Magnesium and lime salts .....	.04 " " "
Carbonates of the alkali metals	" " "

It is well to remember that when acid, saliva contains lactic acid and perhaps traces of other organic acids, due to starch fermentation, and that alkaline or normal condition is due to alkaline phosphates.**

Water in large quantity, lactic acid in traces and alkaline phosphates are the factors to be considered.

Water alone will take from group A boric acid, sodium phosphate and potassium phosphate. The oxides of zinc, aluminium and tin, and silica are practically insoluble. From group B, water will dissolve sodium phosphate, potassium phosphate, and beyond doubt, all mixed phosphates containing sodium or potassium. The remaining phosphates are insoluble in water. All members of group C are soluble in water.

Lactic acid, even in traces, and traces of other organic acids exert the only influence worth consideration on the water insoluble material. It is needless to say of so highly dilute lactic acid what has already been said of water. Just what part the acid plays there is immaterial.

Zinc oxide will readily dissolve in lactic acid, the readiness depending upon the density of the zinc oxide used and the strength of the acid. When of the highest specific gravity, zinc oxide is very slowly soluble, and hence specific gravity is an important point in the powder.

Aluminium oxide is dissolved only when calcining has not been carried on too long. Otherwise it is not attacked by this nor readily by any other acid.***

*Probably no light has been thrown on the actual composition of the phosphates and oxy-phosphates that go to make group B. Isolation of these mixed types and their study are two of the fine problems of chemistry. The fact that their physical properties are so nearly alike allows discussion of the group as a whole.

**Chittenden, R. H., Proc. Amer. Physiol. Soc., 1898, 3.

***At first this may seem to be a favorable point, but when it is reflected that the function of the cement powder is to enter into as complete a union with the cement liquid as possible, shortcomings are apparent.

Silic and tin oxide are diluents, mainly, and are not affected by lactic acid.

Of group B it may be said that with the exception of the water soluble phosphates of sodium and potassium, all members are attacked by lactic acid and organic acids in general, but very slowly. Results so far obtained point to the conclusion that disintegration by lactic acid consumes the excess of oxides first, the actual phosphates finally wearing away as the structure weakens about the particles. (These results will be published later).

Aqueous lactic acid affects group C in exactly the same manner as water alone.

But among these agencies of destruction lies a benefactor in the form of sodium phosphate—the cause of alkalinity of saliva. Ever present, it at least in part neutralizes the lactic acid, which escapes from crevices in which starchy foods collect and ferment. The acid, uniting with a part of the sodium, changes it to sodium lactate and leaves an inert form of phosphate of sodium and hydrogen, also apparently present as a normal constituent of saliva. Lactic acid and other organic acids, which are concentrated at a certain point where food collects, and are not generally distributed throughout the saliva, are the main causes of trouble beyond doubt.

Another property, excellent for the purpose, possessed by sodium phosphate and its allied hydrogenated forms is its ability to redeposit phosphates of a cement from its solutions. In this sense it acts as a guard and a preservative.*

The greater the surface exposed to the solvents the quicker will disintegration follow. It stands to reason, therefore, that all that has been said under porosity applies also to solubility.

It would be well to end the chapter with a table of absolutely comparative experiments. This, however, is in all probability impossible. At least no means has yet been devised whereby truthful results may be obtained. Percentages of substances dissolved by lactic acid solutions are as a rule far from conclusive.

It is interesting to note in the following table the effect of a large excess of water on various cements, this solvent having received little or no attention heretofore. The results were obtained as follows:

The mixtures were allowed to set for the liberal time of forty-eight

*Exactly the reverse is implied in a recent advertisement accompanying a new departure cement, so called. Statements as broad as this, "It cannot be dissolved in ammonia," are legion. In all the analyses of saliva *no* ammonia has ever been found, not even in traces. "No compound of zinc has ever been made that would perfectly resist the *alkalies*," and so on, *ad nauseam*. What maddening jugglery! It is true that zinc phosphate dissolves in ammonia, but it is equally true that it dissolves in aqua regia.

hours. The pellets were then crushed, ground to a fine state and weighed. The powders were then shaken at intervals for several days with 100 c.c. distilled water. From each, 25 c.c. were drawn, evaporated to dryness and the residue weighed.

Then, $\frac{\text{weight of residue} \times 4 \times 100}{\text{weight of powder}}$ equals per cent dissolved.

Cement.	Wt. Powder.	Wt. Residue, 25 cc.	Per cent dissolved.
A	2.2151	.0013	.23
B	....	....	....
C	2.7316	.0033	.48
D	2.0595	.0074	1.4
E	2.8077	.0021	.3
F	3.3668	.0013	.15
G	2.2787	.0016	.28
H	1.8837	.0017	.36
I	4.3138	.0161	1.5
J	1.8517	.0102	2.2
K	.8033	.0075	3.73
L	2.4181	.0085	1.4
M	....	....	....
N	2.3534	.0100	1.7
O	2.0691	.0104	2.01
P	2.8587	.0160	2.23
Q	4.1679	.0040	.38

How admirably these figures sharply divide the two classes and demonstrate where water may do much harm, is seen from the re-arrangement, roughly based on alkaline phosphate contents.

Above 30% and below 42%
alkaline phosphates.

Class I.
I 1.5
J 2.2
K 3.73
L 1.4
N 1.4
O 2.01
P 2.23

Below 10% alkaline phosphates.

Class II.
A .23
C .48
D 1.4
E .3
F .15
Q .38
H .38
G .28

In D, whose liquid contains only four and one-half per cent alkaline phosphates, undoubtedly as impurity, there is found an apparent anomaly. The explanation is simple. D's powder contains silica to the extent of ten per cent. As shown, diluents of this kind retard setting of the third stage by rendering a part of the remaining constituents inert, firstly, and secondly, by replacing constituents required for the purpose of neutralization and equipped for it. As a matter of fact the completion of the third stage in D has never been traced to its end. The large percentage extracted is due to solution of acid phosphates.

Viewed *per se*, simple tests made with lactic, citric or any other acid, are worthless. Only when compared with all other tests and especially with the chemical composition of the cement, do they give data of real value.

There are several reasons for this which may be briefly mentioned.

Firstly, there is a complete absence of the process termed "washing away," which virtually means a combination of solution and wearing. This is not imitated in an immersion test, nor are the solutions for this test made up with any regard for analogy. Not alone are the mass and the bulk to be considered but also the physical nature of that bulk. To more clearly present the matter the following, quoted from a recent advertisement, will serve the purpose. The table consists of a series of supposedly comparative tests made with the cement advertised and several cements from the open market.

Cement.	Initial Wt. in grs.	Wt. after four weeks' immersion.	Loss in grs.	Loss per cent.
Advertised.	30.24	27.18	3.06	10.12
A	17.92	11.10	6.82	38.08
B	12.82	9.00	3.82	29.82
C	15.75	12.85	2.90	18.38
D	26.55	22.35	4.20	15.82

In the first place these are not comparative tests. It is like saying that a stated quantity of water will leave more undissolved material in a hatful of sugar than in a spoonful. Had the same weight of substance been used as in the other cases, percentages dissolved of cement advertised, would be respectively 17 per cent, 23.9 per cent, 19.4 per cent and 11.5 per cent instead of 10.12 per cent, thus defeating its own end by proving itself inferior to C. Or it may be demonstrated in another way:

These tests were made in 3 per cent lactic acid. The directions for working it show that the pellets of varying weights were immersed in the acid. How much is not stated. In the above, the results indicate that about equal quantities were used, but insufficient in each case to dissolve the entire mass. But the solvent or combining power of lactic acid is limited. Two ounces of 3 per cent acid will dissolve exactly twice as much of a given substance as one ounce. Apparently just about enough lactic acid was contained in each test to dissolve 3.06 grains of cement advertised, 3.82 grains of B, 2.90 grains of C, etc. It would dissolve no more of each in four years.

From 30.24 grains of cement advertised were dissolved 3.06 grains or 10.12 per cent.

From 60.48 grains of cement advertised would be dissolved 3.06 grains or 5.06 per cent.

The absurdity is apparent—the cement advertised is better than itself.

Suppose proportional amounts of acid and cement be used—two parts acid to thirty grains of cement and one part acid to fifteen grains of cement, etc. The above objections are overcome but others arise. It becomes necessary to assume exaggerated conditions as examples in order to present round numbers.

Cement X consisting of 10 grams of zinc phosphate requires 2 grams of acid by calculation for complete solution.

Cement Y consisting of 7 grams of magnesium phosphate and 3 grams of silica (total 10 grams)* also requires 2 grams of acid for complete solution of the magnesium phosphate, the silica being insoluble.

In the latter case, then, a comparison would show 30 per cent of pellet unattacked. The logical conclusion of this would be another absurdity—make a cement out of silica! But actually in the process of “washing out” the cements would have shown the same result.

And finally, an indefinite excess of acid will answer the purpose no better.

For the sake of simplicity this may be expressed by illustration:

Suppose the cement to consist of equal parts *by weight* of the substances ○ and ● which have respectively the specific gravities 1 and 2. Let ○ and ● represent equal volumes.

Then ● is twice as heavy as ○ and to meet the above conditions there would have to be in the cement twice as many ○ as ● and a section of it would be represented by



Now it remains only to suppose that ○ is much more soluble in lactic acid than ● in order to see that when 50 per cent weight has disappeared 66.6 per cent volume has disappeared.

Now suppose the conditions reversed:

○ and ● are still to represent equal volumes. Equal parts by weight are to be mixed, etc., but ● is to be the more soluble in lactic acid. It is readily seen that when 50 per cent by weight has disappeared there still remains 66.6 per cent of the original structure. In other words, these are two cements of like solubility by weight and yet more by volume resists acid in one case than in the other. In all these instances the weight is the criterion. All other things being equal that cement is best which is the least soluble by weight. But things are not equal and to arrive at a correct conclusion such tests must be supplemented by others; especially is a knowledge of the constituents and quantity necessary.

A unique series of solubility tests in various acids by means of micrometric measurements is given in the *Dental Cosmos* for January, 1900, by Dr. J. H. Beebe. There are several reasons why the value of these tests must be questioned.

*As high as 15 per cent inert matter was found in some instances.

First, a cement might have become honeycombed, especially if it contained much alkaline phosphate, and yet the surface would not be altered appreciably, thereby affording a micrometric reading which would indicate perfect insolubility.

Second, some cements expand under aqueous fluids, even after having been mixed many hours. Considerable solution at the surface might then well be overcome by expansion and so yield a good micrometric reading.

**Expansion and
Contraction.**

It is an established fact that as a result of chemical action in many cases, contraction or expansion ensues. These phenomena accompany the change from the plastic to the solid state when cements are mixed and no amount of adhesive qualities can prevent it because of the immense force exerted by the expanding or contracting mass; an illustration is seen in the bursting of heavy casks in which lime is confined. Of what avail then are the good qualities when the cement shows shrinkage from the margin of the cavity? How much faith is to be placed in a cement, which for hours continues to expand out of the cavity in which it is placed, until a distinct line of demarcation shows the naked eye that a crystalline growth has taken place?

Heavy containers of steel or glass wherein the trial filling may be packed; a micrometer measuring with an accuracy of one ten-thousandths of an inch to record the shrinkage or expansion in tangible figures; and a suitable microscope to study the surface, to check the micrometer and to examine the margins, are the necessary instruments with which to work in this field.

As these instruments are not intended to make measurements in the mouth the next question is: What are the most suitable conditions outside of the mouth which will combine convenience with exactness?

For convenience of review the conclusions will be given, followed by the experimental results.

1. Trial fillings made by allowing cements to set in water show widely different results.
2. The cause is found in the action of water upon acid phosphates which combine with it to form hydrated phosphates.
3. Water is the chief constituent of saliva and has therefore the same effect as the latter.
4. A cement which has been allowed to harden under water may contract when removed from the liquid.
5. Different degrees of fineness of the powders, which accompany a cement produce different results in and out of water.

6. A cement which expands out of water will surely expand under water.

7. The difference between the results obtained from creamy and thick mixtures not immersed, depends upon the nature of the cement. It is greater with cements of Class II than those of Class I.

1. Trial fillings made by allowing cements to set in water and out of water show widely different results.

Experiment I.		Cement.	Mix.	Time, hours.	Points. Expansion.	Points. Contraction.
Immersed	.....	H	Thick.	120	1½	..
Not immersed	.....	H	"	120	..	20
Immersed	.....	A	"	72	6*	..
Not immersed	.....	A	"	72	..	2*
Immersed	.....	B	"	36	47*	..
Not immersed	.....	B	"	36	..	1

*Break around the margins.

2. The cause is found in the action of water upon acid phosphates which combines with it to form hydrated phosphates.

Phosphoric acid was impregnated with zinc oxide until a solution was produced from which crystals were deposited in three hours. A trial filling made with this, when placed in water after hardening, showed an expansion too great for the instrument to record. After twenty-four hours the exposed surface disintegrated, filling the water with a thick precipitate of flocculent hydrated zinc phosphate.

A liquid was prepared by impregnating phosphoric acid with alumina until molasses consistency was produced. On adding water to this a thick precipitate of flocculent hydrated phosphate of aluminium was formed.*

3. Water is the chief constituent of saliva and has the same effect as the latter.

Experiment II.		Cement.	Mix.	Time, hours.	Points. Expansion.	Points. Contraction.
Not immersed	.....	V*	Thick.	24	..	15
Immersed-saliva	.....	V*	"	24	..	10
Immersed-water	.....	V*	"	24	..	11

4. A cement which has been allowed to harden under water may contract when removed from the liquid.

Experiment U.		Cement.	Mix.	Time, hours.	Points. Expansion.	Points. Contraction.
Immersed	.....	A	Thick.	72	2	..
Removed	.....	..	..	24	..	2½
Immersed	.....	V*	Thick.	34	..	..
Removed	.....	..	..	12	..	2

*Members of Class II.

*Why then should these acid phosphates unite so eagerly with water when it is evident that the hardened pellets lose water by evaporation and contain uncombined water, readily liberated at 110° C, for a long time? (See page 917.) Many similar phenomena in chemistry answer this. It is out of place to treat further of this here. Dilution and temperature are two important factors in these phenomena.

5. Different degrees of fineness of the powder which accompany a cement produce different results in and out of water.

Experiment VI.							
	Cement.	Liquid.	Powder.	Mix.	Time, hrs.	Point expansion.	Point contraction.
Not immersed.....	W	Class II.	Fine.	Thick.	24	...	7
Immersed.....	"	"	"	"	24	...	5½
Not immersed.....	"	"	Med. fine.	"	24	...	22
Immersed.....	"	"	"	"	24	...	12
Not immersed.....	"	"	Coarse.	"	24	...	22½
Immersed.....	"	"	"	"	24	...	6½

6. A cement which expands out of water will surely expand **under** water.

Experiment VII.					
	Cement.	Mix.	Time, hrs.	Point expansion.	Point contraction.
Not immersed.....	F	Thick.	24	3½	...
Immersed.....	F	"	24	60	...
Not immersed.....	C	"	24	30	...
Immersed.....	C	"	24	Too great to be recorded.	...
Not immersed.....	R	"	24	40	...
Immersed.....	R	"	24	Too great to be recorded.	...

7. The difference between results obtained from creamy and thick mixtures, not immersed, depends upon the nature of the cement. It is greater with cements of the acid phosphate variety than with those whose liquids consist of phosphoric acid and alkaline phosphates, i. e., members of Class II and Class I.

Experiment VIII.					
	Cement.	Mix.	Time, hours.	Points expansion.	Points contraction.
	C	Creamy.	24	69	...
	C	Thick.	24	130	...
	H	Creamy.	12	4	...
	H	Thick.	12	...	2
	J	Creamy.	One week.	2	...
	J	Thick.	"	1½	...

In all of the above tests and in many more, left out to avoid repetition, representatives are chosen for each kind of cement. For instance, C, F, and R are of the members of Class II whose liquids are supercharged. A, H, V and W members of the same class represent a group of more evenly balanced substances which set quite rapidly. J is an excellent example of the first class.

They are now ready to receive the light of chemical analysis.

In Experiment I, H was evidently compounded with no knowledge of the fact that water would have an effect. Other tests worked well. A was of the rapid setting variety, which usually show a slight contraction, wet or dry. Although it showed an expansion of two points when immersed, it nevertheless had a marginal break, showing dual movement. B is a popular cement and evidently was made to be exposed to moisture at once. It is an extremely rapid setter; too rapid to always prevent shrinkage.

Experiments II and III showed the hydraulic powers of acid phosphates, which is the cause of their expansion.

Experiment IV was conducted with a member of Class II whose

liquid was not supercharged. Supercharged liquids gave analogous results with far greater expansion.

Experiment V shows that in all probability a part of the water taken up is water of crystallization, which is given up at ordinary temperatures after a time, with consequent contraction.

Experiment VI makes use of a cement of Class II whose liquid was not supercharged. It is another way of stating that constancy in fineness of a powder will insure more constant results.

Experiment VII clearly shows the effect of supercharging, hence slow setting and its dangers.

In many cases these shortcomings are recognized by the compounder, who includes a varnish or wax in the package or advises the use of these. Such coverings are of doubtful use for several reasons readily understood. The alcohol, whether wood spirit or grain spirit, acts upon phosphoric acid, thereby changing the composition of the surface material. All cements in moist condition do not take well to varnish or wax, and even when firmly set it has been shown that the surface of a cement gives off water vapor. When a cement requires protection from water it is because it is supercharged or because its constituents contain insufficient neutralizing material, due to inert matter, silica, etc.; or to inactive alumina or both. Providing that a covering is found that will adhere at all its duration is not long. The slightest disturbance will cause leakage through it. To have a cement so prepared as to require moisture after a brief period, goes a long way toward constant results.

**Resistance
to Pressure.**

This property, so important to every cement, can be equally well read from the composition of a cement. It has a direct bearing on nearly all other properties and is influenced by them. Although conducted under conditions widely different from the conditions in the mouth, the crushing test forms a means of making accurate comparative tests. Alone, it merely states a resistance under abnormal conditions, but in conjunction with the foregoing knowledge it fills the remaining gap of a quite complete line of argument, the threads of which may now be gathered together.

For the purpose of conducting these tests any device is suitable which will record the pressure—usually in pounds—blocks or other forms of convenient but equal size. In the present instance the form of instrument used was of the bow spring kind.

The various cements which were analyzed possess the variety necessary for the subject matter relative to pressure resistance and will therefore be drawn upon. They are given in the order heretofore observed.

Experiment I.

Cement. Block.	Treatment of block.	Time of setting, hours.	Lbs. crushed at.
A {	1 No prolonged pressure.....	54	220
	2 Prolonged pressure.....	54	400
	3 " " ".....	24	304
	4 " " ".....	24	318
B {	1 Prolonged pressure.....	54	320
	2 No prolonged pressure.....	54	200
C {	1 " " ".....	33	Mashed.
	2 " " ".....	33	"
	3 " " ".....	52	58
	4 Prolonged pressure.....	96	100
D {	1 No prolonged pressure.....	10	Mashed.
	2 " " ".....	33	210
	3 " " ".....	33	225
	4 Prolonged pressure.....	33	184
E {	1 No prolonged pressure.....	9	100 mashed.
	2 " " ".....	32	108
	3 Prolonged pressure.....	32	116
F {	1 No prolonged pressure.....	31	152 mashed.
	2 " " ".....	31	147
	3 " " ".....	31	253
	4 " " ".....	31	300
G {	1 No prolonged pressure.....	30	Mashed.
	2 " " ".....	30	67
	3 Prolonged pressure.....	30	165
H {	1 No prolonged pressure.....	24	185
	2 " " ".....	48	390
I {	1 No prolonged pressure.....	52	106
	2 " " ".....	52	134
	3 " " ".....	52	160
J {	1 No prolonged pressure.....	29	104
	2 " " ".....	29	94
	3 " " ".....	29	112
	4 " " ".....	29	98
K	1 No prolonged pressure.....	29½	244
L {	1 No prolonged pressure.....	29	112
	2 " " ".....	29	94
	3 " " ".....	29	90
M {	1 No prolonged pressure.....	28	140
	2 " " ".....	28	226
N {	1 No prolonged pressure.....	130	98
	2 " " ".....	130	180
O {	1 No prolonged pressure.....	29	167
	2 " " ".....	29	119
	3 Prolonged pressure.....	29	212
P {	1 No prolonged pressure.....	34	245
	2 " " ".....	34	268
	3 " " ".....	34	200
	4 Prolonged pressure.....	34	273
R {	1 No prolonged pressure.....	21	Mashed.
	2 " " ".....	21	"
	3 " " ".....	21	"

Several facts must be considered before these results are interpreted. For the sake of accuracy a large number of tests are usually made and an average drawn. This is only necessary, however, when the factors that go to vitiate results are unknown. In making a block it is impossible to produce uniformity of pressure, evenness of shape and parallel end planes at all times. It is also impossible to make all the blocks at the same stage of setting. The structure is also disturbed by removing from the mould before the contents have sufficiently hardened. Too many should not be made from the same mix, because the time offered

for undisturbed progress of the three stages of setting diminishes as the moulds are successively filled. The following series demonstrates the correctness of the statement.

Experiment II. Cement of Class II.—Five blocks in the first and four blocks in the second series, each series made of separate mixings. Blocks allowed to remain in mould for twenty-four hours and are given in the order of moulding.

Block.	Series I.	Lbs. pressure.	Block.	Series II.	Lbs. pressure.
1		264	1		264
2		266	2		250
3*		188	3		200
4		200	4		180
5		212			

Experiment III. Cement of Class II.—Same conditions.

Block.	Series I.	Lbs. pressure.	Block.	Series II.	Lbs. pressure.
1		300	1		370
2		300	2		302
3		242	3		262

The best indication of a well fashioned, well set block is the resulting metallic click that suddenly follows when the crushing strength is reached. It is unmistakable. Only such results are recorded as maximum for the time of setting given, except where the adopted term "mash" is used. No other word describes the phenomenon so well. As the screw turns no increase of force is required. The needle travels completely around the dial with great evenness of motion, impelled by the turning screw, the only resistance to which, is the feeble retraction of the bulging block. No crushing point is registered.

The following points will be immediately recognized in the table of results above.

It is seen:

1. That when a block has remained indestructible in the mould under pressure a higher value is usually obtained.
2. That the term "mashed" appears only in the group A to H inclusive and in R and not in the group I to P inclusive.
3. That the highest as well as the lowest values appear in the former group, vice versa, greater uniformity is observed in the latter group.
4. That time is a great factor; in some cases improving the power of resistance very markedly.

The first point leads to the conclusion that shrinkage and expansion are disturbing influences on crushing strength and when these are in part overcome by pressure, crushing strength is increased.

In the next the effect of supercharging is once more brought to

*Not a good block-split in half at 150.

the front. While the prolonged reaction between neutralizing agent and acid phosphate is active, or "aging"* is in progress, the maximum strength is not reached. A cement that "mashes" remains acid for a long time, will expand when moist and will show permeability even after the "mashing" point has been passed. When perfectly set or combined, however, they will show the highest values for crushing strength, registering at times 400 pounds and over.

They are, furthermore, the substances which yield much water soluble material and which hold the greatest percentage of uncombined water.

Other members of this Class II which show greater crushing strength are A and H, whose liquids are not supercharged, but allow quick "aging." More results of this kind could be given, but these are sufficient.

Of the remainder, constituting a group of members of Class I, it may be said that since they age far more rapidly, their maximum strengths are reached in periods of twenty-four to forty-eight hours and are much lower than members of Class II. Of course, in practical use the presence of soluble salts would soon lower these figures by reducing the resisting power of the structure. The same may be said of cements containing traces of carbonates. These are invariably filled with gas chambers and resist pressure to the least degree.

What difference, if any, in crushing strength is caused by mixing to thin or thick consistency?

What effect have the other commonly used ingredients?

Does a fine powder give better results than a coarse one? These are some of the remaining questions.

In an experimental answer to the first, typical samples were chosen from each group and in each case were mixed to creamy and thick consistency. For reasons cited above only enough blocks were made to show maximum strength.

Experiment IV.

H, Class II.

Block.	Thick consistency. Lbs. pressure.	Time.	Block.	Thin consistency. Lbs. pressure.	Time.
1	185	24	1	297	24
2	390	48			

K.—Class I.

Block.	Thick consistency. Lbs. pressure.	Time.	Block.	Thin consistency. Lbs. pressure.	Time.
1	244	30	1	218	7½
			2	100	24

(See also results on following page, Ex. V. and VI.)

This point has been most satisfactorily answered by Virgil C. Pond, B.P., D.M.D., in a paper presented to the Harvard Dental School, Jan-

*Observed by Dr. E. K. Wedalstaedt in *The Dentist*, Nov. 2, 1899, page 688.

uary 26, 1899. The results above only afford additional proof to the statement "It seems to be a law that the more powder worked into a fluid the stronger the resulting mass."

The distinction made by Ames* between agglomeration and agglutination suggests an explanation.

When little powder is worked into the mass the acid is present in proportion great enough to dissolve or agglutinate the particles of oxide, forming a friable mass. When the powder is in great excess the higher acid phosphates formed agglomerate the particles.

This is further corroborated by the fact that the lesser saturation is accompanied by greater shrinkage and by greater quantity of uncombined water.

H.

Thin consistency.—Loss of water in 48 hours,

Experiment U. 2.2 per cent.

Thick consistency.—Loss of water in 48 hours,

.6 per cent.

In every respect the state of fineness of a powder plays an immense part. Following are some results on this point:

Experiment VI.

B.

Block.	Thick consistency. Lbs. pressure.	Time.	Block.	Thin consistency. Lbs. pressure.	Time.
1	135	28	1	138	24
2**	260	48	1	138	24
..	312	24	..	245	24
..	338	24	..	290	24
		Medium fine zinc oxide.			
		Extra fine zinc oxide.			

It is noted that with increasing fineness there is an increase of strength independent of the consistency. This undoubtedly throws some light on a fact noticed by Dr. Virgil C. Pond (loq. cit.) that the different powders accompanying a liquid often give different results, due, according to him, to addition of varying quantities of inert matter in the form of pigments. Now while the addition of inert matter undoubtedly influences the strength of a cement, there is probably no instrument so delicately constructed as to record the effect of the minute quantities which enter into the finished product as pigments. On the other hand, it is a fact that variations in degree of fineness are highly likely to follow where more exact methods of controlling the degree of fineness, than that of depending upon the eye or working of a mill, is not employed.

What effect have other commonly used constituents on the crushing strength? That depends.

*Dental Cosmos, 1899.

**It was necessary on account of the slowness of setting, due to use of a coarse oxide, to use a block made 48 hours for comparison.

The influence of magnesia is distinctly good as is seen in cement A, whose powder contains about ten per cent. The cement belongs to Class II and the time of setting is hastened by the magnesia. In fact it is not possible to work long in mixing as otherwise the mass becomes too stiff. The strength of one block was over 400 pounds after the short period of twenty-four hours. Aging has no material effect upon this product.

Tin oxide and silica weaken a cement when mixed mechanically. M and L show the effect of ten and fifteen per cent tin oxide plus considerable quantities of silica, and D the effect of ten per cent silica strengthened by the same amount of magnesia. A cement of this nature, minus the silica, should show a test approaching four hundred pounds.

Aluminium phosphate, in a liquid, has a desirable effect on the strength, depending on the amount used and the substance with it is used in conjunction. Used alone on all but the densest oxides, it tends to produce a quick setting but hard and brittle mass, which under best conditions rarely possesses a strength above one hundred pounds. Used in conjunction with zinc phosphate it can be made to produce excellent results, scarcely affecting the strength and greatly lessening the time required to yield maximum strength, i. e., "aging," over that when the acid phosphate of zinc is used alone. Traces of impurities, such as ferric oxide, sulphates, lime, etc., are without appreciable effect here.

All matters heretofore considered pertain to hardness or resistance to abrasion, also. The same factors that increase resistance to pressure, operate here. After all, pressure applied with a sharp edge, such as a knife, is only a little different from that applied with a blunt edge. Its special purpose is to detach the agglomerated particles from a surface instead of throughout the mass and to find the flaws which the crushing machine only registers but does not discover; and to distinguish with ease the members of the two classes and the members of the highest crushing strength of each class.

Cements have the property of showing a tendency to split along certain lines, under the knife, into smaller masses, each of which is hard and resisting.

Nearly all cements show different results in the dry and wet state. In the latter case, the surface being easily removed for depths varying with the kind of cement. There is no need for entering into repetition on these points here.

It is my belief that the zinc oxyphosphate type of cement is the only successful cement that can be made with phosphoric acid as a basis. This is another way of saying that a new departure cement must have a new departure liquid as well as powder. This is based on observa-

tion and research, in which many cements were made of excellent quality in every other respect than that most important one—a timely disappearance of acidity or, in other words, a complete combination. Zinc oxide is the only substance suited to fulfill the combined conditions of density, color, neutralizing and agglomerating power and finally, of general stability. If oxyphosphate of copper were white it would form the most perfect cement of the day. In crushing strength, insolubility, preservative qualities, time of complete setting, etc., it is excellent. Unfortunately its color is a militating feature. No degree of calcining will render zinc oxide inert and yet it makes a fine distinction between the weakly acid, highly saturated acid phosphates present in the last stages of setting, and the deleterious carbonic acid of the air. It does not absorb carbonic acid air, but it does unite easily with the weakest acid phosphates, readily neutralizing the last traces. Lime and magnesia are excellent neutralizers, but make no such distinction. They also do not possess the evenness of neutralizing power of zinc oxide. In small amounts they make good addition to a powder, for reasons set forth, but only then when wholly or in greater part chemically united with the zinc. All attempts to use alumina as a base I have found from personal experience, and have noted in the experience of others to be unsuccessful. When alumina is used in light form it neutralizes fairly well but contracts, in a violent reaction, to a brittle mass. Calcining it destroys its neutralizing power. Lime added to it restores this in a measure but the bulk of the neutralizing falls on the incapable alumina, the lime being changed to phosphate, usually with too great an evolution of heat, and on this phosphate depends the agglomerating power. With the bulk of the mass inert, the substances which agglomerate it subject to the same solubilities in lactic acid, and worse still, subject to the inroads of water, it is difficult to see how zinc oxide as a base can be superseded in the phosphate type. Oxides of other metals act either too sluggishly or too violently, or are too unstable. The ideal modifier is an oxide of not too basic a nature. Modern modifiers are all that can be asked—they fulfill this condition. The ideal cement will be found outside of the phosphate class.

Meanwhile the one great fault of zinc oxyphosphate—its slight solubility—must be reduced to a minimum by a better study of the fitness of things. The best cement is the one which has this at the front, even at the slight sacrifice of all remaining properties or at a greater sacrifice of a property of minor importance.

Infective Ulcerative Stomatitis.

By Dr. E. R. WARNER, Denver, Colo.

Read before Colorado State Dental Association, June, 1902.

The existence in this locality at the present time of a variety of infectious stomatitis, assuming proportions bordering upon an epidemic, is the motive prompting me to write upon this subject. The lesion is characterized in its early stages by a slight tumefaction and redness of the soft tissues in and adjacent to the interproximate space with free bleeding upon pressure of the finger or tongue. The patient may be made aware of the action of the brush causing hemorrhage, or the presence of blood upon the pillow in the morning. A disagreeable taste in the mouth, especially in the morning, is noticed. This condition may exist in the mouth for some weeks without a suspicion of its true nature. In its advanced stages tissue necrosis takes place, creating pockets of considerable size. There is destruction not only of the soft tissues but also of the septum of alveolus. The taste becomes extremely objectionable to the patient, and the odors emitted are quite obnoxious to a bystander.

There are in some instances neuralgic manifestations and slight elevation of temperature. While saprophytic fungi are unquestionably responsible for this pathological condition, it is not my intention to enter the bacteriological field in the discussion of its etiology, but to speak more especially from a clinical point of view.

From the multitude of micro-organisms whose habitat is the mouth, it would require much time and careful work to isolate the specific germs responsible for this state of affairs. We know what treatment will lessen its ravages or bring about a cure, and it is to this point that we will apply our time and consideration. It seems most common in early adult life, but no age is exempt. It appears in the mouths of the robust as well as the afflicted, but unquestionably the uncleanly mouth predisposes to attack. One occurrence does not give immunity to future attacks. Pyorrhœa cases having pockets of some size, and where the tissues are below par, offer favorable access to germs and give rise to combined troubles. Its mode of transmission is direct or indirect, but in all probability carried to the mouth by the fingers or by eating or drinking utensils, whether in restaurants, hotels or in the home. Dental instruments and the hands of the operator no doubt play an important part as possible carriers of infection.

I have stated that the interproximal space is the most favorable location. This is because the hidden recesses afford ample opportunity

for multiplication of germs, and the ordinary act of mastication is not sufficiently powerful to bring about the destruction of the germs by the intermingling of the fluids of the mouth.

Attention may here be directed to the deceptiveness of these pockets because of the filling by diseased tissue and waste food products. To the casual observer no pocket exists, but closer observation will sometimes reveal a depth of nearly one-fourth of an inch. Extension may take place to the labial and lingual aspects and to the mucous membrane of the cheek, where there is an abraded surface. It is very probable many cases of ulcerative tonsilitis may have their origin traced to this cause. The lesion seems to be a local and not a constitutional one, although general symptoms may arise by the passage of vitiated food and mucous in the stomach, with associated gastric and intestinal disturbances.

Diagnosis. In the diagnosis of this affection, among the lesions to be eliminated, may be mentioned pyorrhœa, aphthæ (canker sore) and syphilis. True pyorrhœa is more chronic than acute and has its characteristic flow of pus upon pressure of finger and not a freely bleeding surface. It affects all aspects of the tooth and not necessarily the interproximal space. It may be complicated with the ulcerative stomatitis, in which case you would have both pus and blood. Aphthæ usually occur as isolated patches, most common at the juncture of the two mucous surfaces, such as the gum with the lip or cheek, or the floor of the mouth with the tongue. The sores are very painful.

In the secondary and tertiary stages of syphilis, breaking down of the osseous as well as the soft tissues is apparent, and the tissue necrosis gives rise to unpleasant odor. The mucous patches with the grayish white pasty covering may for a time resemble the ulceration of the non-specific stomatitis. These patches are, however, rarely painful. Constitutional symptoms will be manifest, assisting in clearing diagnosis.

Treatment. The treatment to bring about the quickest and best results should be radical. Go to the seat of the trouble. Remove the food products from the interproximal pockets by forced syringing. Napkin the mouth carefully and apply upon a small applicator of non-corrosive material a taper of cotton with a solution of the caustic astringent order, sufficiently powerful to destroy the ulcerative surface and germs present. Pack the pockets well and retain dressings for some minutes, avoiding the escape of solution to the non-infected area. While the pockets are packed, with a fine taper of cotton and the solution wipe out carefully the crevices of the free margin of the gum. Among the commonly used remedies may be mentioned nitrate of silver, trichloroacetic acid, aromatic sulphuric acid, lactic acid,

iodide of zinc and creosote and iodine. Use these agents in solution slightly caustic and not so powerful as to destroy much living tissue. Subsequent application of same solutions much weaker in strength will promote granulations and not arrest growth of tissue. In cases of very deep pockets it is frequently advisable to have patient use a syringe after meals previous to rinsing mouth with antiseptic washes. Among the antiseptic washes used by the patient I may mention Listerine, borolyptol, Pasteurine and similar agents, preferably if combined with an alkaline solution similar to glyco-thymoline. Those solutions containing formaldehyde are excellent in exterminating odors. Use the solution several times daily in the strength of one to four parts of water. The great danger of continuance of the trouble is the reinfection of the new granulations from the area where the germs have not been destroyed. It will require weeks of time for the pockets to become filled with new tissue in the extreme cases, but where the cause is taken away the good results will come. In proportion to the thoroughness of the first operation depends the frequency of subsequent treatments. The method of procedure and the thoroughness practiced are of greater importance than the particular remedy used. Remove the debris, then destroy the ulcerative surface and promote healthy granulations. Keep the food products away so that the mouth washes may gain access to the pockets, and your cases will progress favorably.

Dentistry of Today.

By M. H. SMITH, D.D.S., Denver, Colo.

Read before the Colorado State Dental Association, June, 1902.

Perhaps never in the history of the dental profession has there been a time when the demands have been so great on the dentist as at present. It is said that the practice of law has degenerated into a hunting for precedents upon which to base decisions, but in dentistry the bewildering multiplicity of inventions, remedies and authorities make it absolutely necessary that a progressive dentist be an individualist in the fullest meaning of the word. Inasmuch as every thought and act produces a definite impression on the whole, and only the perspective of time will show which is of greater or lesser value, we cannot penetrate too deeply nor range too widely in our search for whatever may be of value or benefit in our work. The skilful and successful operator is only evolved by absolute fidelity and honesty to each case which comes to his hands. Char-

acter is a most important factor in the make-up of the dentist of to-day. He must be honest with his patients and his work, not only because honesty is the best policy, but because he is honest from within, and will not violate his own self-respect.

Every thought and act of a man's past experiences is worked into the present moment. How important it is, then, that we think for ourselves and not be imitators only. Imitation never made a master. The best men in our profession differ largely in methods and materials used in their practice. I will give an illustration or two.

Perhaps dentists are equally divided on the subject of whether teeth to be capped for crowns or bridgework should be devitalized. Some are very strong in their advocacy of devitalization, others equally positive that the pulps should be left alive. Again, in the treatment of pyorrhœa alveolaris, think of the wide variety of medicines advised by different men, such as trichloroacetic and sulphuric acid, Black's mixture, zinc chloride, eucalyptol, glyco-thymoline, etc., while some rely almost wholly on surgical means, syringing out the pockets with simply hot water. I have mentioned just a few of the remedies which differ widely in their action. Again some say this disease is constitutional, others that it is purely local. So we might go on using unnecessary time in enumerating other things, showing how dentists differ in diagnosis and treatments. To my mind all this goes to show that we must think for ourselves, but we must have a reservoir from which to draw. This only comes from earnest and careful study.

We should give each individual case the thought and time necessary, that our patients may have the best possible service at our hands, the dentist thereby adding to his store of knowledge from which to draw. We have but to look around us, in our cities especially, to find large numbers who make dentistry of today a means only of getting money from their patients with the least possible amount of thought, time and work. These men lack the character and honesty of which I have been speaking, and do much to injure our profession in the minds of the people, which we all feel and suffer from to a greater or lesser extent.

To help overcome this (aside from individual character and work) I think there is no greater factor than our dental societies. It is a question whether there is a dentist so old in experience, so young with lack of experience, so ignorant or so well educated who can attend the meetings of our societies with a desire to learn and go away without absorbing something which will be of benefit in his practice. So I say, come one and all, join us in this work, and we will be of help to each other. Some one has said our societies are like the ocean, where each individual drop is free to move, and from the lowest depth of the mighty deep *may* rise

to the surface and glitter on the crest of the highest wave that rolls. They are open to all, rich and poor alike. It only requires that a person applying for membership shall be a reputable dentist and a gentleman.

The best investment I ever made was the time spent from my office and the money required to attend dental conventions. Another good investment is a liberal supply of the dental journals. We can absorb from these and apply in our practice that which appeals to our judgment. Without these helps and the inspiration derived therefrom, we are liable to get into ruts that have been abandoned in the light of science. Great changes have been made in the practice of dentistry in the past few years. Men eminent in dentistry who a few years ago advocated certain lines of practice have been obliged to change to new and better ways. In order to keep in line with all this advancement and be up to date it is imperative that we should keep in close touch with each other, laying aside all bickerings and jealousies. To do an unprofessional act only shows our own weakness. We will be misjudged often, both by our brother dentists and by the public, but this is no reason why we should not stand together, doing our best to give our chosen profession the standing which it deserves.

Antiseptics.

BY WILL P. SMEDLEY, D.D.S., Denver, Colo.

Read before the Colorado State Dental Association, June, 1902.

I intended my paper to be entitled "Asepsis" rather than "Antiseptics," but I do not know that it matters particularly, as I seem to have touched upon nearly the whole list of allied subjects, that is, asepsis, antiseptics, oral hygiene and prophylaxis, without, however, following any one of them far enough or closely enough to bring you any new or valuable information. But if, by asking a few questions and bringing up a few points I can arouse a vigorous discussion, we may profit by a consideration of this exceedingly important topic.

Nothing in the history of the healing art has done so much toward placing the study of diseases, their prevention and treatment, upon a firm scientific basis as the study of bacteriology. To be sure, we did not find that all diseases are caused by bacteria, nor that all bacteria cause diseases, as some early enthusiasts tried to believe, but we have found that many of the most dreaded diseases are caused either wholly or in part by micro-organisms, and, what is more important, we are rapidly

learning to inhibit their growth or counteract their influence by the use of antiseptics and antitoxins. Compare the proportion of deaths from wounds in the Spanish war with that in the Civil war. The very striking difference is due almost entirely to the present thorough knowledge and practice of asepsis. And compare the death rate from diphtheria at the present time with that before the use of antitoxin. I wish I might go on and present a similar comparison in regard to dental caries and pyorrhea alveolaris, but at present it would be a little premature—only a little, however, I hope and firmly believe—for with such men as Miller, Black, Williams and Goadby working so diligently in this line, the *science* of dentistry is surely destined to gain rapidly upon the *art* of dentistry.

Asepsis. This subject of asepsis is one that cannot be too seriously considered by the dentist, dealing as he does with the mouth, which is undoubtedly the most fruitful field for the propagation of bacteria to be found in the human body. We all know that it is practically impossible to render the mouth strictly aseptic even long enough to perform a simple operation, but it is possible to pretty thoroughly sterilize the instruments, hands, etc., before inserting them in another mouth, thus avoiding the possibility of transmitting infection from one person to another, which is more to be feared than the infection of a wound in the mouth by organisms already contained therein.

The knowledge which every dentist has, that he may some day inadvertently inoculate a patient with that dread disease, syphilis, should be incentive enough to induce him to practice the most scrupulous asepsis; but in this glorious State of ours we are confronted with a greater necessity for care than probably anywhere else in the Union, for there is scarcely a day on which we are not given an opportunity to transfer a vigorous colony of our dreaded enemies, the tubercle bacilli, from one mouth to another. And it is not alone important to carefully sterilize instruments after use in suspicious mouths, for it is claimed that, at one time or another, most micro-organisms may be found in the mouth, and that organisms of virulent diseases are often found in healthy mouths, where they may lie dormant for lack of proper media for their development, but which, transferred to a mouth affording proper nourishment and insufficient resistance, may produce disease.

Sterilization of Instruments. There are many methods of sterilizing instruments, but not one is eminently satisfactory. Bichloride of mercury, our most efficient germicide, is almost valueless here, on account of its corrosive action upon steel and nickel, so we seem restricted to the use of heat and the milder germicides. There seems no chance of freezing out our enemy,

the microbe, as he quickly revives after a bath in liquid air, 320° F. Thorough boiling is an effectual way of destroying all micro-organisms, but has the disadvantage of injuring the temper of the steel. The addition of a little sodium carbonate to the water aids in dislodging whatever accumulation may be upon the instruments and also prevents rusting and increases the germicidal action. Passing instruments through a flame, as advocated by some, would, I fear, as surely destroy the temper as the organisms. Simple immersion in any of the numerous antiseptic preparations would doubtless be effectual if continued long enough, but time is a consideration, and we might not wait until sterilization were complete. Of the various liquid preparations offered us, the hydrogen dioxide is probably the most effective, used in this way. One of the most simple and at the same time effective methods is immersion in pure carbolic acid, followed by rinsing in water, preferably boiling. In formaldehyde, which, though discovered in 1868, was not thoroughly appreciated until within the last few years, we have an admirable sterilizing agent. The aqueous solution, formalin, quickly corrodes polished steel, so, for this purpose, we are limited to the use of the gas. This gas may be generated either by heating the prepared paraform lozenges or by the vaporization of methyl alcohol in a lamp arranged for the purpose. Instruments placed in an oven and exposed to this gas will be sterilized and not injured in any way. So far, it is an ideal method; but they must remain in the oven from ten to thirty minutes—too long to keep the next patient waiting—and the scheme of duplicating instruments is prettier in theory than in practice. Dr. Low, of Buffalo, urges that we sterilize an entire cabinet and contents during the night with a formaldehyde generator that he has arranged. Here again there is an objection. We might wish to use our instruments a second time during the day. Then, to sum up the foregoing, after doing some subtraction, it would seem that the agents best suited to our purpose are formaldehyde gas, and carbolic acid and boiling water, with a preliminary scrubbing with soap and water as a useful adjunct.

**Care of
the Hands.**

As for the hands, a thorough use of pen knife, brush, soap and warm water with the addition of bi-chloride 1-1000 or formalin 1-250 after suspected cases, I believe sufficient. Personally I have found the use of germicidal and antiseptic soaps offered us to so roughen the skin that I did not consider the hands to be in so nearly an aseptic condition as when kept smooth through the use of less pretentious soaps. There is no place in the present order of things for the dentist who keeps his instruments upon his table until they are too thick to be located, and then, perhaps, puts them away without washing; who wears a greasy

sleeved smoking jacket at the chair, and is content to wash his hands before meals; for the public is being educated, and the man who lacks the proper consideration for the welfare of humanity probably has the business instinct that starts him in the right direction.

With the mouth teeming with all kinds of bacteria, we might well fear to cause even the slightest abrasion of the soft tissues, for fear of infection by some of the pathogenic organisms that are almost sure to be present, were it not the fact that we all know by actual personal experience that a wound in the mouth will heal a great deal more quickly than one anywhere else in the same body. Why is this? Do the myriads of micro-organisms that inhabit the oral cavity serve to counteract each other's influence, or is this immunity from infection due to the action of the leucocytes? If the latter, is it caused by the phagocytic function of these white corpuscles, or, as Dr. Kirk suggests, "is the essential germicidal action dependent upon the elaboration of a germicidal proteid substance, alexin, which is inimical to bacterial life?" Or is the saliva the controlling force, as suggested by Dr. Barnes? Dr. Williams says that a greater variety of micro-organisms is found in mouths that are comparatively healthy than where some specific disease is found. This might indicate that the various organisms tend to place a wholesome restraint upon each other, and that it is only when the territory is invaded by one variety in sufficient numbers to overpower all others that serious results follow. There is no doubt, however, that the mouth is often the source not only of local but of general systemic infection.

Early in the history of bacteriology the mouth was recognized as offering an excellent culture medium for numerous varieties of bacteria, and Dr. Miller, followed by others, has for years been making a study of the micro-organisms that habitually inhabit the mouth, to ascertain which ones might cause dental lesions and in what way they accomplish the results. The commonly accepted belief now in regard to dental caries is that the active agent in the destruction of tooth structure is the acid product of certain micro-organisms. As soon as microbe was declared guilty, he was sentenced to death, and our friends, the pharmacists, hastened to provide us, for the wholesale slaughter of both innocent and guilty, with numerous germicidal and antiseptic mouth washes, composed of a large variety of ingredients known to be individually detrimental to germ life. At first they seemed to overlook the fact that other acids beside the lactic, butyric and acetic that appear to be the varieties produced by the micro-organisms, might be in some measure deleterious to tooth structure, and most washes gave a decided acid

reaction, but later favor turned toward alkaline washes, due, of course, to the fact that the investigators had concluded that caries is the direct result of acids produced by bacteria, hence the antiseptic for the microbe and the alkalinity for his acid product. But, here, on the other hand, Dr. Goadby says: "Mouth bacteria grow best upon an alkaline medium." If both conclusions are correct, and they probably are, what are we to do—inhibit their growth by the use of an acid wash, or use an alkaline wash to counteract the resulting acid? Really I do not believe it makes much difference, as the effect of either is quite transient. Most of the antiseptic preparations contain boric acid, thymol, menthol and essential oils, as eucalyptus, cassia, gaultheria, peppermint, etc. In this class might be placed listerine, pasteurine, borolyptol, benzolyptus, thycalol, borated cassia, borine, euthymol and glyco-thymoline. To such ingredients as are above mentioned, the manufacturers of borolyptol added two per cent of formaldehyde, which increased its antiseptic properties to such an extent that formaldehyde has since been added to other preparations, notably pasteurine. Hydrogen dioxide, while not as agreeable to the taste as some other preparations, is one of the most efficient antiseptics to be used in the mouth.

As for the patients' treatment of the mouth, it should be called hygienic rather than aseptic, and our program says that subject belongs to Dr. Hall, so I shall pass it by, except to say that, under the heading "Oral Hygiene" we have the prime factor of prophylaxis, and prophylaxis should be the chief aim in our profession. Thorough cleanliness is undoubtedly one of the strongest factors in the prevention of diseases of the mouth, for bacteria cannot flourish without their proper media or food supply upon which to subsist, and normal saliva does not furnish that proper pabulum. Hence it would appear that if the teeth and mouth could be kept thoroughly clean, the troubles would be at an end.

As asepsis of the mouth practically ceases with the removal of the antiseptic wash from the mouth, it seems as though, instead of struggling on in vain attempt to free the mouth from all germ life, for we are not at all certain that some are not actually beneficial, we should endeavor to inhibit the growth of those organisms that cause caries and pyorrhea by robbing them of their necessary food supply. Or perhaps, when some of the tireless workers in this line determine their identity, there may be an antitoxin produced that will render inoperative these enemies of mankind. Dr. Goadby, who seems to be nearing the goal, says: "The acid production of organisms is a curious phenomenon, more particularly as the natural growth of bacteria results in an alkaline reaction, and that only certain species in the presence of proper media can bring about a revision of the alkaline reaction." He also says: "There is no specific

organism of dental caries." Or perhaps, instead of trying to get at the organisms direct, we should endeavor, through systemic treatment, to so alter the secretions of the mouth as to furnish an unsuitable medium for their growth. We may be encouraged to pursue this line of thought by the fact that the same teeth with the same care are at times more prone to decay than at others, due probably to a change in their environment caused by systemic variations.

We may well be pleased with the wonderful advancement that has been made in the art of dentistry even within the recollection of the present generation, pleased with our ability to provide artistic and satisfactory substitutes for lost teeth; pleased with our ability to reconstruct and restore to usefulness and comfort teeth broken down by caries, and still more pleased with the latest and highest achievement in dental art—our ability to not only restore the usefulness of decayed teeth, but to do it in such a manner, with porcelain inlay and crown, that we preserve the natural beauty of the mouth. We should not, however, be content with this, for we have a far higher and nobler mission—the prevention not only of the ravages of caries, but of that more serious affliction, pyorrhea alveolaris. When we succeed in this, we may indeed be removed from the list of avaricious money seekers and placed among the benefactors of mankind.

Dentistry and Dentistry.

By ALVA D. CAGE, D.D.S.

Read before the Oklahoma Dental Association, May 8, 1901.

In thinking over various subjects that would interest you as dental practitioners, it is a difficult matter to find one that has not been discussed, if, indeed, not old and monotonous, yet when you turn the most familiar of these over and examine its every phase you will find something there you did not suspect and with which we are at least not so familiar. It brings a something of benefit to us that well rewards us for the time spent, and often reveals that something of which we are so eager and desirous—something new.

It is well enough not to pass the seemingly familiar by too hastily lest that "new" thing should go unseen and rob us of what we desire most—knowledge, proficiency, excellency. These we must have to master the situation we have undertaken, and with the above should go hand in hand principle, honor, industry.

Let us for a moment consider one of the above named acquirements, which is a requirement as well.

Proficiency. Proficiency has its own reward, and if there is one acquirement a man should strive for above all, it is proficiency. I would rather be a proficient dog catcher than a bungling dentist, or a good tooth puller than a failure all round.

Let us as individuals and as a profession get at the bottom of dentistry and follow where it leads, and select that branch which best suits us and which we best suit.

Every man differs, not only in opinion, but in gift and talent. If a man finds mechanical work suits him best, let him perfect himself as nearly as possible in that branch. If he finds himself leaning to operative work and he desires to become more skillful at the chair, let him stay there and improve his workmanship with what skill he has. Every man should be proficient in one branch and do his best at all.

So far as concerns myself, I shall welcome the day when operative and mechanical dentistry shall each have its followers and be separate as are the specialties of medicine. The mechanical man, the operative man. The mechanical man can take with him his extracting, as can the operative man his crown and bridge work.

When a man is articulating or finishing a set of artificial teeth, he does not like to be called to the chair to insert a difficult gold filling, or if he is at the chair for a period of two or three days, he becomes more interested there, and his plate work becomes more difficult to him for a while.

The longer a man stays at one branch the more easily it comes to him; and the more he falls in with that line of work the more he becomes attached to it. Familiarity may breed contempt, but it also adds proficiency. When you sound any man of ordinary ambition, you will find in him more or less desire for proficiency.

But there are many pitfalls for the young man of today, and unless he hews close to the line in one, he may fall. Many of use lose our way by allowing this fallacy and that amusement to come between us and our work, and what we desire most to attain—the top round—we fail to reach. The profession has today men in it who are more interested in making money or in an outside “scheme” than they are in digging out dental problems, and when you see this man at his work you may put him down as a failure and one whose aspiration is the dollar rather than proficiency. It is a fault, a weakness, with many of us to let opportunities escape us by looking for something great, something to startle, something of fame, or something which is above our capability. It is right to aim high, but

before we walk we must crawl. We must prepare by years of study, days of toil, hours of thought, before we can hope to press the button of distinction.

Gentlemen, we owe it to our profession, we owe it to our patients, we owe it to ourselves, to be proficient.

Let us grasp the daily opportunities that come to us; let us take that at our feet before we reach for the distant things. Think of the pleasure to a man who is qualified to handle the most difficult case with ease, and the comfort he has in possessing the confidence of his patients. He enjoys his work, and his profession is a genuine pleasure to him. But take the man who in slovenly fashion does his work, some of which he is not sure of, some he "hopes" will be all right, and no wonder he is displeased with his profession and quits it to "go into other business." He is doing the wise thing, and if he cannot sell out, he would better "go out." This applies to the young man first.

A man may mistake his calling and take dentistry. This is indeed unfortunate, but may happen to good men. And when a man finds himself in the wrong vocation it is doing himself and others an injustice to remain therein. On the other hand, if he has chosen wisely, years make him more and more in love with his work, and failures only strengthen his determination.

It is the little atoms that make the mighty mountain, so it is the little points we gather that, at last, make learned men.

Every operation should be one of note, every plate of artificial teeth bring some new thought. Study every case presented, and if you find all there, you will have learned something new.

Let us, gentlemen, be students. Let us be men of thoughts and a progressive class. May we lay not down the armor until the battle is won. Then ours shall be the grandest profession among men. Dentistry will be what we made it. The strongest and weakest plant requires feeding to nourish and sustain; thus it is with ours. One century ago where was dentistry? Even fifty years ago we were considered subs or branches, but today we are a grand profession, recognized as such by the world, and one which commands a place second to none in the world of professions.

Relation of Student to College and State Dental Board.

By T. J. WELCH, M.D., D.D.S., Pensacola, Fla.

Read before the Florida State Dental Association at Datona, May, 1902.

Today, as you gentlemen know, a man's knowledge of the science of dentistry is not considered when he comes to enter college; some of the schools will thoroughly examine an applicant's preliminary education, and if up to their standard will admit him to the freshman course; again there are other schools who care very little about his preliminary education, being over desirous to secure students, and as a member of the State Dental Board for the last ten years, I have at times wondered how some ever entered college and received their diplomas. There is something radically wrong. I have had in my practice as assistants graduates from the best Eastern and Western schools, yet they were not competent to take care of my office. I have also had with me a progressive and proficient young man, with ten years' experience, whose preliminary education was good, and his knowledge of dentistry first class, yet this deserving young man, from a recent interpretation of our State law, regulating the practice of dentistry in our State, had to attend college and graduate in order to practice.

The humiliating part of this for him was that he was compelled to enter the freshman course with the "kids," boys who knew nothing at all of dentistry, and attend three courses in order to be eligible to practice and enjoy that which he had done for the past ten years.

Yet today this same thing exists, and shall we sit still and allow this injustice to continue? Has the National Association of Dental Faculties the legal and constitutional right to object to the grading of applicants on entering schools? Most assuredly not a just right.

I can recall with pleasure two graduates of the University of Virginia, one of medicine, the other of law, who some twenty-five years ago, graduated in one term. Why? Because from untiring study and ambition they had qualified themselves and justly received credit for what they knew. I believe this same rule is yet in existence at the University of Virginia, and Johns Hopkins University, Baltimore, where an applicant who so desires may be thoroughly examined, and graded accordingly.

I care not how one acquires an education; it may be as in our grandfather's days, in a log cabin, from the light of pine knots, or the candle or the gas, or yet more modern, the electric light; it is sufficient to know he has it.

When I graduated in dentistry, there were a number of men in our class of thorough proficiency, who graduated at the same time as I did,

and they were not placed in the first course. It was the natural ambition for knowledge that brought Mr. Lincoln out, and possibly no one labored more under disadvantages than he, with no special teacher, yet in 1858, he was considered one of the brightest lawyers in his State, and finally received the highest honor in the gift of our people. Yet one with the same superior knowledge of dentistry today, according to the National Association of Dental Faculties, would be placed in the freshman course. This condition is as wrong as the tyranny and oppression imposed by the British in 1775, causing our people to call a halt and demand justice from those in authority.

It seems to me there is, according to the present mode of proceeding, a premium on extorting money unjustly, and no reward for proficiency or brain development, and no stimulus for a young man to study out of college walls, if he expects credit for his knowledge, and now that one more year is to be added to our college course, it will be for the sons of the rich, to the exclusion of the deserving and ambitious sons of the poor.

Our county school authorities realize the significance of this fact, and when an applicant comes from another State to enter our schools, he is thoroughly examined and placed in the grade that he deserves to be placed in. This is justice, nothing more nor less.

**Grading
Undergraduates.**

In ITEMS OF INTEREST for last month I read an article by Price Cheaney, M.D., D.D.S., of Dallas, Texas, in which he makes a plea for the undergraduates along this line, and also suggests a way by which such men could be graded. I do not think his suggestion practical, viz., that all applicants meet a special Board and come from all over the United States. This would cost too much to determine their grading. A more practical and convenient way would be to meet the Boards of Dental Examiners in their respective States, and let these Boards decide their preliminary and practical standing, by giving the same examination that is given to those just out of schools, with such changes as the Boards deem necessary. The fee for this examination could be the same as for regular practitioners, the applicants to receive a certificate of grade to present to their selected school.

I tell you, gentlemen, the State Dental Board is the right body to conduct this preliminary examination in every case, because some of the schools demand the essential elements as a formation to build a profession upon, while still other schools are so eager for students that they are too superficial in their entrance examination; the result is we have more graduates in dentistry from those schools, who are not qualified to be in a learned profession. Again the Dental Boards can easily conduct these examinations in connection with their regular applicants, and by this

mode we could select a better and more suitable lot of men for the dental profession than are now being passed through some of the colleges.

The State law recognizes the ability of our State Boards in conducting examinations of graduates just out of school and granting certificates to those qualified to practice, and I see no reason why the law should not be so changed as to compel all to take this preliminary examination and grading, for it is a move in a line for higher education and better material, and would meet with the support of the best schools.

The greatest protection we have today is the Dental Board; the colleges realize this, and some of them in their annual catalogues point with pride to the large percentage of their alumni, who pass satisfactory examinations before the State Dental Boards, and I think they should refer to this with pride. This is a great stimulus to the schools in preparing their students.

And I will venture to say that if the State Boards did not exist, at the present time, we would have at least twenty-five per cent more dental schools in our land and the proficiency of the schools lowered at least twenty-five per cent.

I have always contended that a written examination is best, and in 1892 I wrote an article, which I read before this association, entitled "Right of Appeal," which was published in the September number of the *Cosmos* of that year. We did not, at that time, conduct the written examination, but we do now, and it is generally done throughout the States.

I could not see where any injustice might be done either applicant or Board, and the manuscript would protect all concerned. I am not opposed to the four year course, for I believe there are quite a number who need it, but for the sake of right and justice do not place a proficient and deserving man in the freshman course, who should enter the junior or senior.

Central Dental Association of Northern New Jersey.

In response to an invitation from Johnson & Johnson, the Central Dental Association of Northern New Jersey instead of meeting in Newark as usual, made its opening meeting of the season a trip to New Brunswick for a tour of the Johnson & Johnson factories to see the practical application of aseptic methods in the manufacture of surgical dressings and the absorbent cotton preparations used in dentistry. The attendance was exceptionally large, there being one hundred and twenty-five present. The invitation was for afternoon and evening, the tour of the large plant which occupied the afternoon being followed by a dinner.

The souvenir menus were in keeping with the occasion, the white cover bearing the red cross, the inside sheet upon which the menu was printed being of cottonoid, and there was an atmosphere of asepsis about all of it.

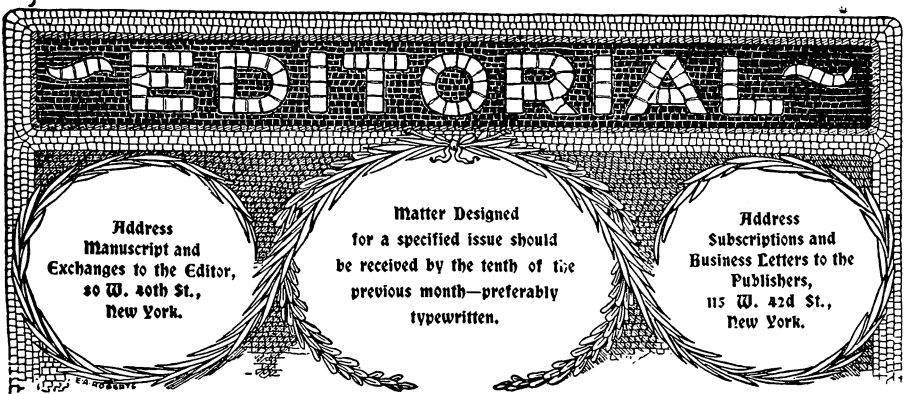
In addition to the usual floral table decorations there was a red cross in the center of each table and the knives and forks had a little doily folded around them bearing the red cross and the word "sterilized." There was good music and a fund of humorous story telling that made it an unusually jolly occasion.

Following the dinner, President Fisher called the meeting to order and announced for the evening: A Talk Upon Germs, by F. B. Kilmer, Ph.C., and a paper, "Asepsis as Applied to Dentistry," by A. Irwin, D.D.S., of Camden, N. J. Mr. Kilmer's remarks were illustrated with the stereopticon and were most interesting. He took up the various forms of disease germs, showing their form with the stereopticon, and the growing germs in test tubes which he passed about for inspection, and told of the various means employed in dealing with each. He laid stress upon the point that a strong solution of "common sense" was the most important weapon in combating them.

Dr. Irwin's paper, "Asepsis as Applied to Dentistry," was a concise statement of the necessity for aseptic methods in the dental office, dealing particularly with the absorbent preparations that they had seen in the afternoon and comparing them with the wash dental napkin formerly used.

Dr. Stockton, of Newark, in extending a vote of thanks to Johnson & Johnson, said in the course of his remarks that he had learned much that afternoon and that he felt that he knew more of the practical application of aseptic methods. He said that he had once asked what J. & J. stood for and was told that it stood for "Just Johnson," but today he had found out that "Just Johnson" meant also "Just cleanliness"—surgical cleanliness. It was near midnight when this most enjoyable occasion was brought to a close in order to get the late trains.





The Flattery of Imitation.

With this number we conclude the sixth volume of *ITEMS OF INTEREST* in its present form, and a little retrospection may be permissible. In August, 1896, *ITEMS OF INTEREST* was purchased by the Consolidated Dental Manufacturing Co., and the present editor was given *carte blanche* to effect improvements.

In January, 1897, the magazine appeared in its new dress and with an entirely new policy. The alteration in its appearance was a surprise to our readers, because there had been no blare of trumpets to announce the departure in advance. This in itself was one of the distinctive characteristics of the new policy. Improvement, continuous and progressive, without anticipatory advertisement. Indeed it was determined that the magazine itself, from that time onward, should be its own best advertisement. This has met with more than achievement. *ITEMS OF INTEREST* has grown better and better, year by year. No beaten track has been followed, for it has been our pride to constantly provide new features so that the reader would never know just what to expect when removing the journal from its wrapper. It is needless to enumerate the novelties that have been introduced from time to time, our readers being fully cognizant of them. There is one fact, however, to which we cannot resist the temptation of alluding, and this relates to what we have called "Exclusive

Contributions." Our subscribers have become so accustomed to finding high class reading matter prepared expressly for our pages that probably very few realize the magnitude of our accomplishment. Indeed the figures have proven amazing to ourselves, now that the computations have been made.

It is the custom of other dental journals to carry a department under the general heading of "Original Communications." Under this caption they place indiscriminately matter prepared expressly for them, and papers which have been read before dental societies. When it is remembered that before 1897 *ITEMS OF INTEREST* was mainly a digest of current literature, the audacity of the new departure is appreciated, especially when it is pointed out that when changing the journal from a magazine of clippings to one of original record, we had the temerity to open with a department entitled "Exclusive Contributions," placing society proceedings under the captions "Society Papers" and "Society Discussions." Thus, in a sense we burned our boats and set out on untraveled fields. Some there were who prophesied failure. Before citing the figures of our success, we will ask all those who have had executive management of dental meetings, to recall the difficulties of obtaining five or six papers for the programme of an annual meeting, that they may comprehend the following statement:

We find that in the past six years we have published in the department of "Exclusive Contributions" no less than 276 separate articles covering 940 pages. In addition to this, in the department of "Orthodontia," we published 47 articles covering 166 pages, and in that of *Prosthodontia* 89 articles occupying 474 pages, a total of 412 articles and 1,580 pages. But even these figures, great as they are, do not wholly represent the facts. For a time we ran monthly descriptions of dental offices under the caption "Office and Laboratory" and many important and interesting short papers appeared under the heading "Incidents of Office Practice." Again, much original matter has been presented in the "Editor's Corner," a convenient place for very short but very useful practical hints; the same is true of many of the letters which have come under the headline "Correspondence," and of course our Book Reviews have all been specially prepared by men competent to criticise. But of all these latter we make no particular computation. We rest satisfied with the record of 1,580 pages

of absolutely original articles, and ask our readers whether any dental text book of that size would not be readily sold for the six dollars which covered the six years subscription to *ITEMS OF INTEREST*? This being true, it is patent that all this special matter has practically been a present to our readers, for besides, we have given over 4,000 pages of the same class of matter which fills the pages of the other journals.

We are compelled to admit, and pleased to make
The Flattery of the admission, that the profession has fully appre-
Our Contemporaries. ciated and encouraged our efforts. Indeed the
splendid results could not otherwise have been
achieved. The practitioners at large, without solicitation on our part,
have hastened to add their names to our lists, while the very best writers
have voluntarily sent us their manuscripts. For all this we tender our
sincerest thanks.

A word in regard to circulation. We hesitate to give the exact figures because such statements are usually received as "excusable journalistic lies." Suffice it therefore to say that in six years we have just trebled the circulation; that on October first, 1902, we found 922 more names on our list than at the same date a year before; and that today our foreign list is ten times what it was in 1896. One thing more; absolutely no individual receives annual subscription to this magazine gratis. Exception to this rule is made in favor of libraries in some instances, but all others pay for *ITEMS OF INTEREST*.

This matter of circulation may not particularly interest our readers, but it has been the occasion of much concern to our contemporaries, and as it has been said that, "the sincerest flattery is imitation," we have been interested from time to time to note that various features introduced by us have been adopted by other publishers hoping thereby perhaps to share a little in our prosperity. In this we trust they have been successful, for it is for the welfare of the profession that the best of its journals should succeed. Finally, and apparently as a last resort, we note that the principal magazines have been brought down to our price, and we are proud that the influence of *ITEMS OF INTEREST* has been such, that hereafter dentists will obtain their journals for less money.

During the past few months we have been inundated with circulars foretelling the great improvements that are to be made in the new year

in all of the journals. If all promises are fulfilled our current literature will have made tremendous strides. In this connection we have practically no announcement to make. We bind ourselves by no promises except to follow our past policy of continuous improvement wherever improvement becomes possible. Of our plans for 1903 we prefer to keep silent, as otherwise we destroy the element of surprise, and lessen the pleasurable anticipation of our readers. At the same time, as 1903 brings us to the twenty-fifth year of our existence, our Silver Anniversary as it were, we may at least promise that *ITEMS OF INTEREST* will maintain its standards, and be as good as in the past; perhaps a little better.





The Care of the Teeth.

By SAMUEL A. HOPKINS, M.D., D.D.S., Professor of Theory and Practice of Dentistry in Tufts College Dental School, New York.

S. Appleton and Company, 1902.

This is a small treatise of 150 pages, which reflects the greatest credit not only on the author but on the publishers, who have been alive to the advantage of placing such a book before the public.

There is nothing in the book that should be either new or novel to a well informed dentist, though its perusal will be found most interesting, and if the practitioner has a soul, it should lead him to higher aspirations and ideals.

This book is intended more especially for the general public and of this class more especially for mothers and physicians. It is a most timely arrival in this respect and should find a permanent place on the reading table of every dental waiting room. In fact the distribution of the little volume to the majority of mothers would be a good investment for a number of dentists. The language of the author is always plain and so simple as to be readily understood and while we do not entirely agree with the author in all of his scientific deductions, nevertheless the study of the little volume by non-dentists can only be productive of the greatest benefit.

The desire of the author to be well thought of by his brother dentists has led him to attempt a serious defense of their shortcomings in the way of attending to the prophylactic care of the mouth. No criticism of this failure of a large portion of the profession can be too severe and only by continually holding this base portion of the profession up to the scorn of honest men can improved conditions be expected. The author sees fit to bewail the fact that unlicensed assistants are not permitted to cleanse and polish the teeth of patients and then advises that directions for doing this be carefully given to mothers, etc., for the little ones.

We agree with the author's views on the advisability of such work being taught to unlicensed dentists but go further and contend that

there is nothing in the dental laws that prohibits such work by an unlicensed assistant, especially when done under proper direction and supervision. We disagree entirely with the recommendation of attempting to teach such work to the mothers, on account of the harm that can be done.

We do not coincide with the opinion of the author as to the rarity of acid saliva; nor do we think he has placed the question of treatment of irregularities in a judicious way. In fact all his views on page 75 in reference to the objections to regulating teeth are at variance with present modern methods in the science of orthodontia.

His reference to severe pain and nervous irritation and interference with mastication and consequent digestive disturbances are all in contradistinction to modern methods. His conclusion that four out of five cases of regulating fail, is also at variance with orthodontia statistics.

It is unfortunate that antiquated notions of the author on this topic should be introduced into such an otherwise admirable treatise for home perusal. Page 75 can do much harm and it is to be hoped that the author will most carefully revise it for the next edition.

M. L. R.



CORRESPONDENCE

Rapid Crown Method.

Editor ITEMS OF INTEREST.

Dear Sir: I note the publication of a "rapid method of constructing shell crowns," by Dr. F. B. Olwin of Hammond, Indiana; and your commentary upon the same, in the Editor's Corner of the November issue. While the Doctor refers very pleasingly to my work in this connection, and it is gratifying to know that he has read the same with interest, it seems quite evident that he has not followed it very closely, because the same method advocated by him, and its possible advantages, was presented, considered and illustrated on page 13, January, 1902, to which I take occasion to thus call his attention. Cordially yours,

HART J. GOSLEE.



State Society Meetings.

Colorado State Board of Dental Examiners, Denver, Colo., Dec. 2.

District of Columbia Dental Society, Washington, Dec. 16.

Odontographic Society of Chicago, Feb. 16, 17, 1903.

Ohio State Dental Society, Columbus, Dec. 2, 3, 4.

Pennsylvania Board of Dental Examiners, Philadelphia and Pittsburgh, Dec. 16-19.

South Dakota State Board of Dental Examiners, Mitchell, S. D., Jan. 7, 1903.

Odontographic Society of Chicago.

CELEBRATION OF THE FIFTEENTH ANNIVERSARY, FEBRUARY 16TH AND 17TH, 1903.

It is the aim to make this a most memorable event in every particular. Papers have been secured from some of the leading men in dentistry, and the subjects selected for discussion are those of the greatest interest to the profession today. Two half days will be devoted to clinics, and every operation of importance will be performed. The exhibitors will be present in full force with all the latest appliances and inventions. Chicago extends a cordial welcome to the profession from every quarter of the globe to attend this meeting.

C. N. JOHNSON, President,

F. H. ZINN, Secretary.

Institute of Dental Pedagogics.

The tenth annual meeting of the Institute of Dental Pedagogics will be held in Chicago, Dec. 29, 30, 31, at the Palmer House. All who are interested in Dental Education are cordially invited to attend. The following program has been arranged.

Papers:

"Teaching Operative Procedure," Dr. C. N. Johnson.

"Teaching General Anatomy to Dental Students," Dr. Borland.

"Teaching Electricity and Its Dental Uses," Dr. W. A. Price.

"Teaching Embryology," Dr. I. N. Broomell.

"Teaching Applied Physics," Dr. G. V. Black.

"Physical Diagnosis."

A symposium on the "Management of the Teaching of Demonstrators in the Infirmary," by four professors.

Report of Committee on "Four Year Curriculum."

Report of Committee on "Nomenclature."

All new teaching appliances must be submitted to Dr. Whitslar, of Cleveland, or to Dr. Patterson, of Kansas City.

HART J. GOSLEE, President.

W. EARL WILLMOTT, Chairman Exec. Board.

H. B. TILESTON, Secretary and Treasurer.

South Dakota State Board of Dental Examiners.

The South Dakota State Board of Dental Examiners will hold its next meeting for examination of candidates for licenses to practice dentistry in South Dakota at Mitchell, S. D., on Wednesday, Jan. 7, 1903, beginning at 9 a. m.

All parties wishing to come before the Board at this time must make application to the Secretary on or before Dec. 30, 1902.

Candidates are expected to bring operating outfit, filling material and patient.

G. W. COLLINS, D.D.S., Secy.

Vermillion, S. D.

The Hartford Dental Society.

At the annual meeting of the Hartford Dental Society held on the evening of Oct. 13, 1902, the following officers were elected: President, Dr. J. Warren Harper; Vice-President, Dr. Edward Eberle; Treasurer, Dr. E. R. Whitford; Secretary, Dr. A. W. Cawee. Executive Committee, Dr. E. B. Abbey, Chairman; Dr. T. K. Steele and Dr. A. E. Cary.

The Pennsylvania Association of Dental Surgeons.

The Pennsylvania Association of Dental Surgeons held its fifty-sixth annual meeting on the evening of October 14, 1902, at the Continental Hotel, Philadelphia. The following officers were elected to serve during

the ensuing year: President, Dr. Wilbur F. Litch; Vice-President, Dr. Geo. W. Cupit; Secretary, Dr. J. Clarence Salvas; Treasurer and Librarian, Dr. Wm. H. Trueman.

During the past year the following papers were read and discussed before the Society: "Combination-fillings," by Dr. Joseph Head; "Obtundents," by Dr. Chas. S. Moore; "The Difference in Method of High and Low Fusing Porcelain for Filling Teeth," by Dr. W. A. Capon; "A Practical View of the Plastics," by Dr. J. Clarence Salvas; "Alveolar Abscess, Its Complications and Treatment," by Dr. J. F. Wessels; "The Danger of Infection of the Eye of the Dentist While Operating," by Wendel Reber, M.D.; "Calcification of the Dentin and Enamel and Its Relation to Hypersensitiveness of These Tissues," by Dr. I. N. Broomell; "Adenoids and Their Relation to Oral Deformity," by Dr. M. I. Schamberg; "A Sketch of Edward Hudson," by Dr. Wm. H. Trueman; "General and Local Anesthesia With Special Reference to Its Application in Operations Within the Mouth," by Dr. E. Quin Thornton, M.D.

J. CLARENCE SALVAS, Secretary.

Southern California Dental Association.

The fifth annual meeting of the Southern California Dental Association was held at Riverside, Cal., Oct. 20 and 21. The following officers were elected: President, Dr. J. W. White, Los Angeles; First Vice-President, Dr. C. S. Lane, Santa Barbara; Second Vice-President, Dr. J. W. Neblett, Riverside; Treasurer, A. T. Covert, Long Beach; Secretary, Dr. Lewis E. Ford, 307 South Broadway, Los Angeles.

Mississippi Valley Medical Association.

The twenty-eighth annual meeting of the Mississippi Valley Medical Association was held in Kansas City, October 15, 16 and 17. The following officers were elected for the ensuing year: President, Edwin Walker, M.D., Evansville, Ind.; First Vice-President, Hugh T. Patrick, M.D., Chicago, Ill.; Second Vice-President, Wm. Britt Burns, M.D., Memphis, Tenn.; Secretary, Henry Enos Tuley, M.D. (re-elected), Louisville, Ky.; Treasurer, Thos. Hunt Stucky, M.D. (re-elected), Louisville, Ky. Chairman Committee of Arrangements.

Next place of meeting, Memphis, Tenn., Oct. 7, 8 and 9, 1903.

HENRY ENOS TULEY, Secretary.

111 W. Kentucky Street, Louisville, Ky.

1903. — 25th Anniversary Volume — 1903.

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December
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The 25th Anniversary Volume



It is with great pleasure that the publishers of ITEMS OF INTEREST announce the production of the 25th Anniversary Volume of this journal for 1903.

A fact most interesting to ourselves, and, indeed, a feature of vital importance to all publishers is the matter of circulation. There is nothing which so distinctly marks the success of a publication as the demand for it, and it is gratifying to state that in this respect ITEMS OF INTEREST largely surpasses every other dental journal of the world.

The value and interest of a dental magazine is not so much in the quantity of miscellaneous literature it presents to its readers as in the nature of the articles published. The original articles and those exclusively prepared for ITEMS OF INTEREST by the most eminent of the profession have constituted a department renowned among the greatest works of dental literature. The text books first printed in these pages are worth many times the cost of a year's subscription. More of them are to appear during 1903 and the magazine as a whole is a well-established medium of the greatest professional minds on the subject of dentistry.

The variety and scope of the writings for this department is without limit and no other group of treatises contributes so much of the value and enlightenment that the profession derives from dental journals.

To appropriately observe the 25th Anniversary, it is fitting that the coming volume should be the best production in the history of the journal, and to this end important articles of absorbing interest, artistic illustrations of special merit, valuable books, and numerous innovations of timely consideration are now in course of preparation. The current news and the other topics regularly reported heretofore will appear not only under most favorable conditions but will be enhanced by the spirit of improvement which will mark the new volume.

It is the support which the profession has liberally given that enables us to so broadly extend our efforts, and this continued patronage will be reflected in still finer offerings to our readers.

Consolidated Dental Mfg. Co.

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By **WALTER WOLFGANG BRUCK**
Instructor in the Dental Institute of the Royal University of Breslau

This is the latest and most authentic text book on the use and application of porcelain as a material for filling teeth. It treats the subject in minute detail and is especially designed to afford the beginner a knowledge of the method in all its scientific bearings and to be a faithful guide and adviser during his practical study of it.

To those who are skilled in the art, it presents valuable information hitherto unknown to them and much that will encourage and stimulate them in independent work in this field.

It is a comprehensive elaboration of the Jenkins system and every condition presented in the application of this rapidly growing art is vividly set forth.

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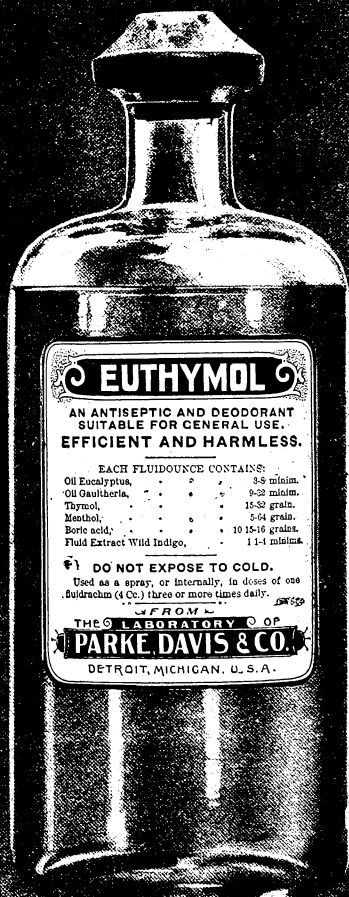
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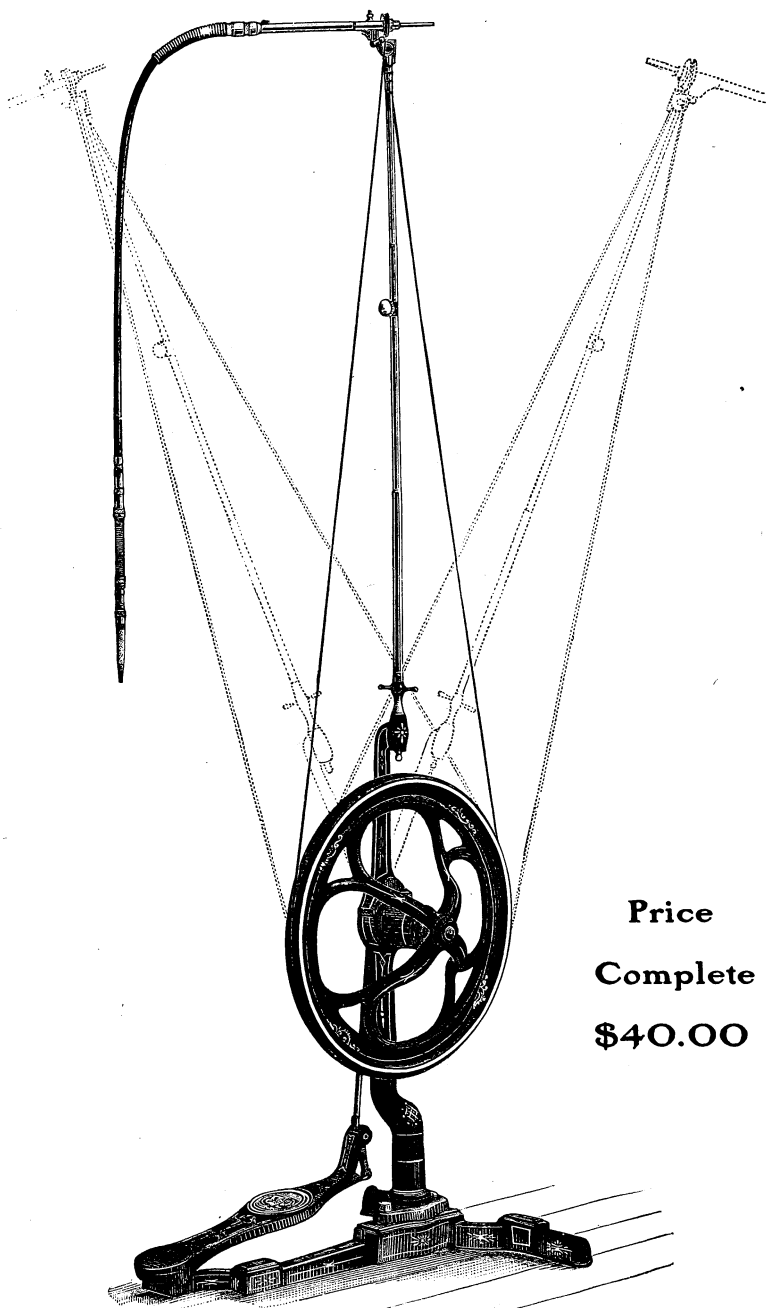
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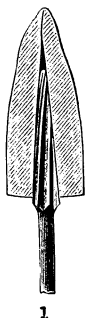
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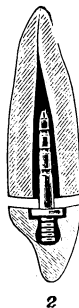
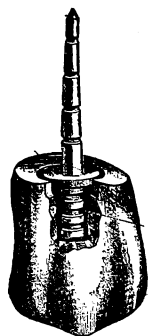
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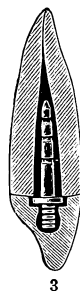
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By avoiding the necessity of baking the pins with the crowns in the process of their manufacture, we are able to use a metal pin many times "stronger and stiffer than the platinum pin." This overcomes the stretching and bending of the pin after the crown is "set," and we can therefore use a smaller pin, and avoid cutting away the dentine, thus obtaining more durable adjustment.

In preparing a root for a Davis Crown an ordinary reamer is used, as Fig. 1 illustrates. After the root and crown are ground to fit, the pin is cemented into both, as is shown in Figs. 2 and 3. Any good cement may be used for this purpose, and will retain the crown securely. The concave shoulder of the pin gives great strength to both root and crown, as well as assisting in joining both securely together. The great strength and rigidity of these pins will allow of their being filed and cut to suit special cases, without impairing their strength for all practical purposes. If a flat pin is wanted, the pin may be filed to that shape and it will still be adequately strong. Fig. 5 shows how the pin can be split and adapted for bicuspid. When it is deemed necessary to band the crown onto the root, it can be practically done, as Figs. 6 and 7 illustrate.

The "quality" and "texture" of the Davis Crown is very similar to that of English teeth, as the crown can be ground with a fine emery wheel, and, by using a little putty powder on a felt wheel, "can be polished" equal to its original appearance.

The "character" of the Davis Crowns is remarkable. In cutting of the moulds for their production nothing has been spared to make them faithful reproductions of natural teeth.

The Davis Crowns are manufactured in a great variety of forms and sizes, in centrals, laterals, canines and bicuspid. A very good assortment can be had in the mahogany case illustrated, which contains one hundred of various kinds, sizes and shades.

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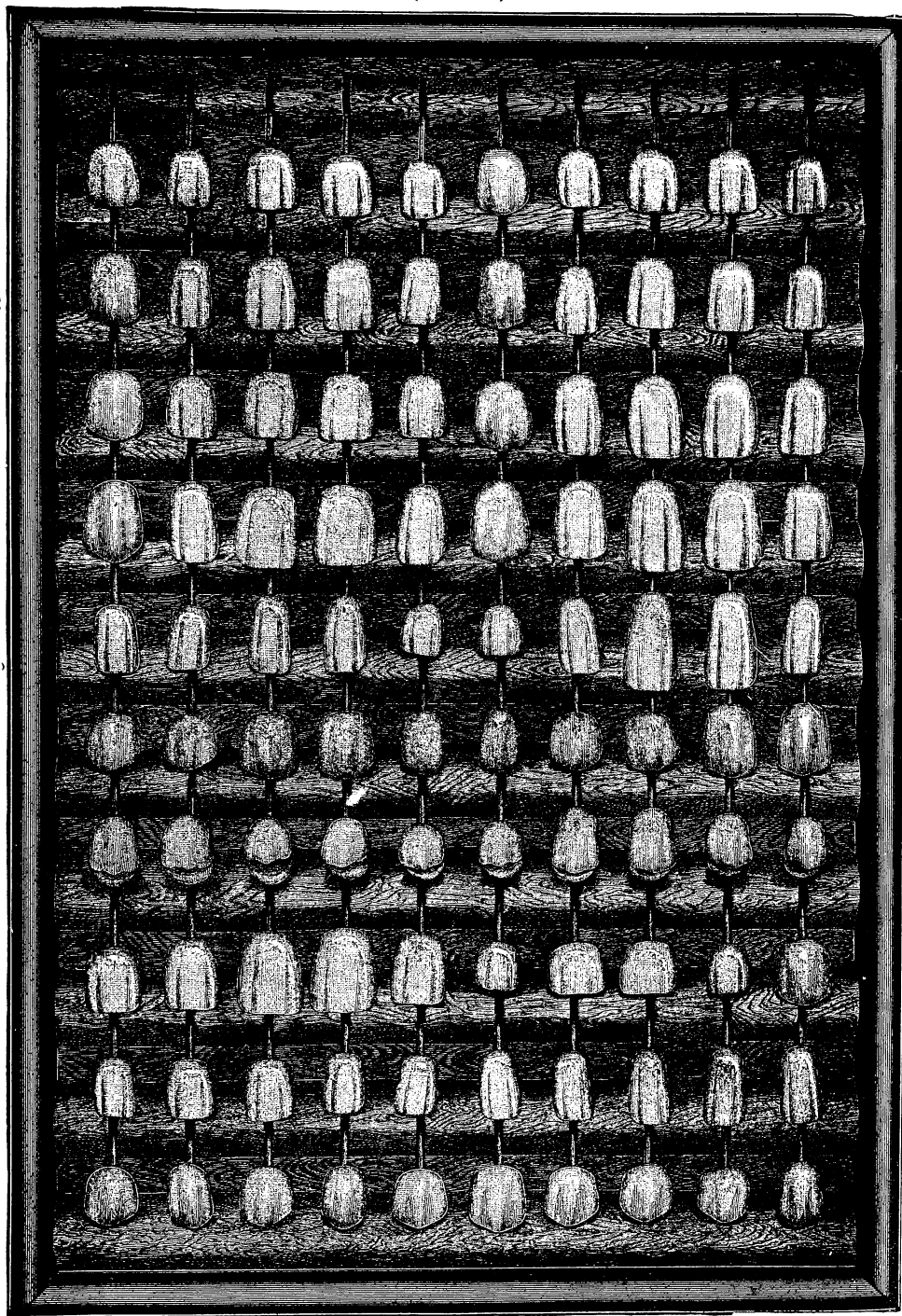
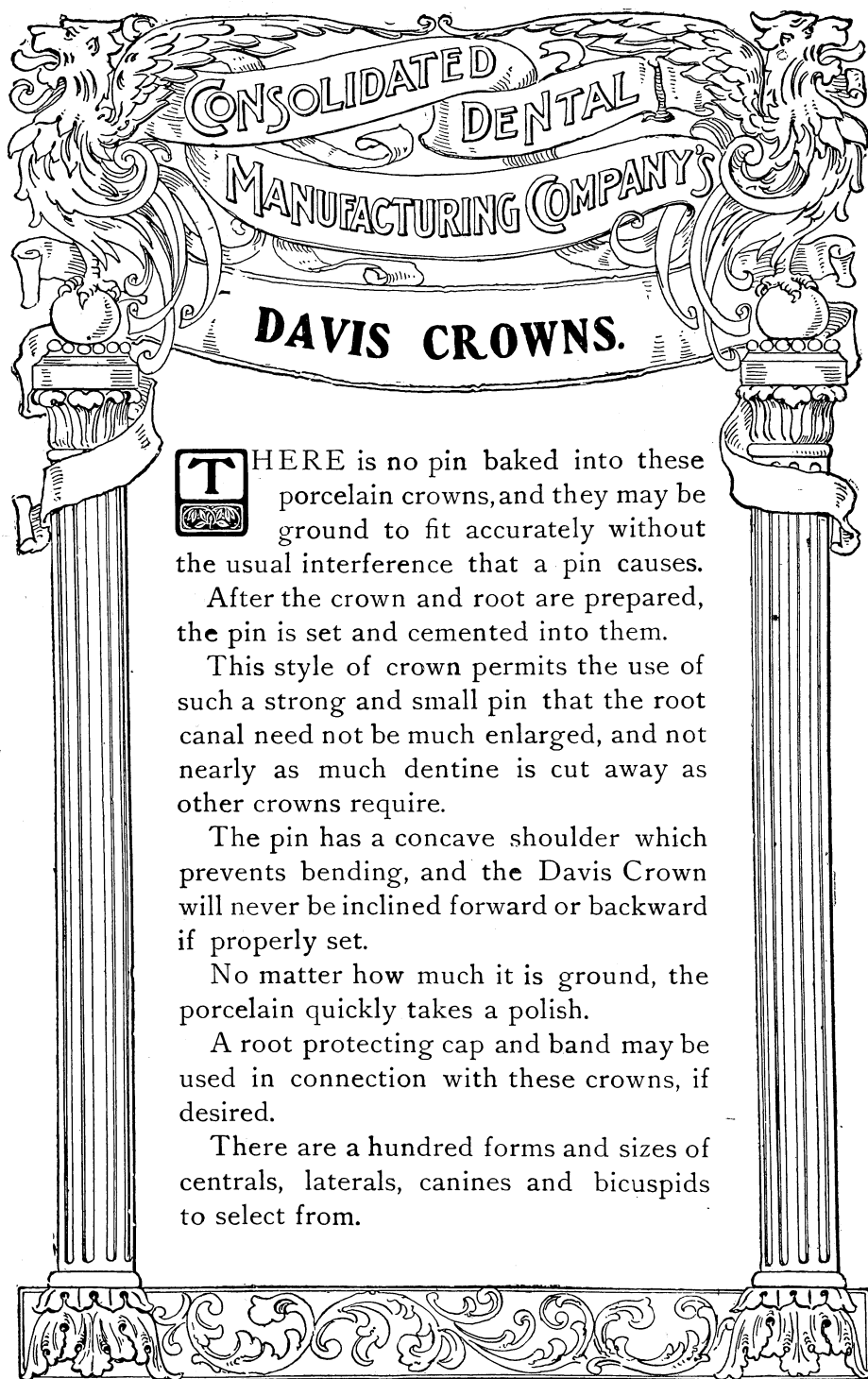


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After the crown and root are prepared, the pin is set and cemented into them.

This style of crown permits the use of such a strong and small pin that the root canal need not be much enlarged, and not nearly as much dentine is cut away as other crowns require.

The pin has a concave shoulder which prevents bending, and the Davis Crown will never be inclined forward or backward if properly set.

No matter how much it is ground, the porcelain quickly takes a polish.

A root protecting cap and band may be used in connection with these crowns, if desired.

There are a hundred forms and sizes of centrals, laterals, canines and bicusps to select from.

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This stopping is made of the purest gutta-percha and prepared with great care to avoid crumbling and the deteriorating effects of oral excretions. Moisture will not permeate it, and for use close to the pulp it is the only safe preparation made. It is rendered plastic at a very low degree of heat.

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BECAUSE



Consolidated teeth are exceedingly strong.

They are not porous and may be ground to any shape.

Being hard and dense they take a high polish quickly.

When heated they do not lose or change color.

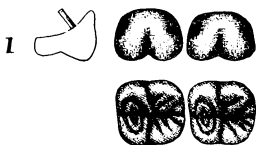
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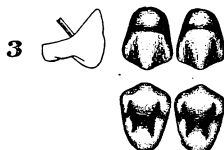
There are no pinholes in the enamel.

The colors resemble the natural, delicate blend and are without streaks.



Small black spots so commonly found in porcelain teeth and which always betray their artificial nature, are never seen in Consolidated teeth.

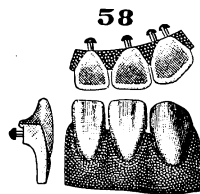
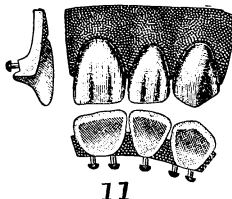
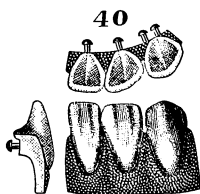
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THIS Cement adds to the perfection of your most delicate work and assists you in your particular and exacting cases. It sets moderately fast, and, with its glue-like adhesiveness and ease of manipulation, is the most reliable Cement ever made.

The liquid does not crystallize and in mixing, German Fused Oxide is very smooth and never crumbles. Saliva and acids have no deteriorating effects upon it whatever and it never softens or dissolves, being absolutely impervious.

It does not shrink and always retains its adhesiveness. This property is especially valuable in exposed work on regulating appliances.

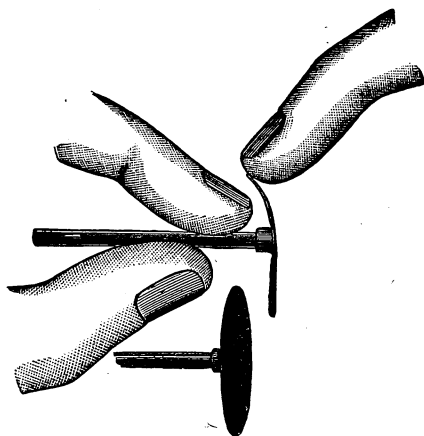
For setting Porcelain Crowns a better working Cement cannot be obtained.

No. 64.

LEAMING'S

"VULCAN" CARBORUNDUM AND CORUNDUM WHEELS DISKS AND POINTS.

FOR PLUG-FINISHING AND BRIDGE-WORKING.



No. 480.

These Wheels are made by a new process, rendering them very sharp and tough. They are practically unbreakable, and do not become gummed like ordinary corundum. The character of the binding material makes them so tough as to allow of remarkable thinness all the way through to the mandrel, thus rendering their use possible in places inaccessible with the old-fashioned wheels. Many operators use them as a substitute for the diamond, as they readily cut the enamel; and they can be used for preparing cavities in porcelain teeth.

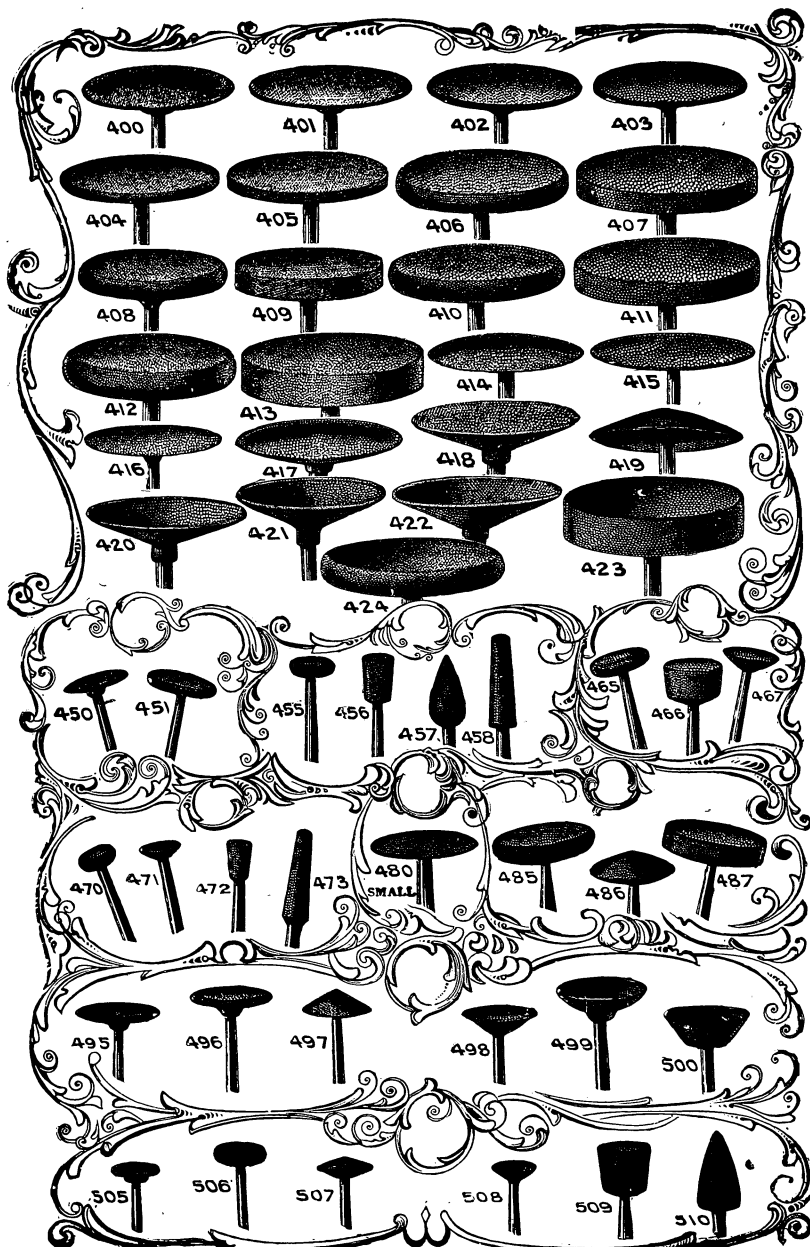
Each wheel is trued and securely mounted on plain mandrel for the dental engine while in the mould, and is guaranteed to run absolutely true.

Attention is particularly called to No. 480 shown above. It is very thin and flexible, but tough and will bear a hard push edgewise. Intended for separating and polishing.

The Vulcan Disks and Thin Wheels can be had "Safe-sided" if desired; and will be furnished either side smooth, as called for. Order by number.

PRICE, PER DOZEN,	-	-	-	\$2.00
" EACH,	-	-	-	.20

LEAMING'S "VULCAN" CARBORUNDUM AND CORUNDUM WHEELS DISKS AND POINT'S.



LOWER PRICES

... IN ...

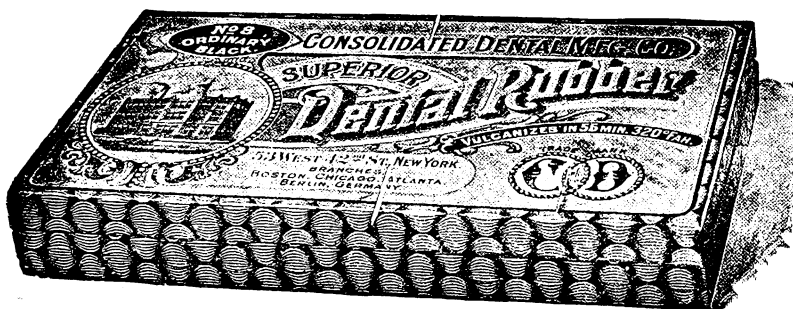
RUBBER

The following Vulcanite Rubbers are Reduced from \$2.25 to **\$2.00** per pound.

No. 1. Light Orange	No. 4. Mottled (Light Red)	No. 7. Jet Black
No. 2. Medium Orange	No. 5. Mottled (Dark Red)	No. 8. Ordinary Black
No. 3. Dark Orange	No. 6. Maroon	

IN QUANTITIES

5 pound lots	...	per pound, \$1.90
25 pound lots	...	" 1.80
50 pound lots	...	" 1.70



PRICES ON FOLLOWING REMAIN UNCHANGED

No. 9. Light Pink	No. 11. Dark Pink	No. 13. Weighted (Light)
No. 10. Medium Pink	No. 12. Weighted (Heavy)	
Nos. 12 and 13	...	per pound, \$3.00
Nos. 9, 10 and 11	...	" 4.50
Perfection Pink	...	" 6.00

If sent by Mail, 16 cents PER POUND extra to pay postage

These prices, both retail as well as quantity rates, are subject to our regular SPOT CASH discounts, according to quantity

Consolidated Dental Mfg. Company

PERFECTION PINK RUBBER

We handle a large assortment of dental rubber and know the average demand for the various kinds, but of all varieties, **PERFECTION PINK RUBBER** is the leader in magnitude of sales. From month to month the sales have shown a marked increase with an unprecedented call for samples. It is plainly shown that a trial of this rubber leads to its continued use.

Its delicate color has invariably captivated users of vulcanite rubber. No other rubber possesses such a perfect resemblance to the natural gum shade.

It takes an ideal natural finish and that "glossy" or "dead" appearance is entirely absent.

It does not fade or discolor, in which respect your patients are bound to be pleased.

Exceptional toughness combined with necessary elasticity is one of the characteristics which has made **PERFECTION PINK RUBBER** the favorite of hundreds of dentists to the exclusion of all other brands.

A trial will assure you that for its individual purpose, it surpasses any other rubber made.

Put up in 1-4 lb. package. Price \$1.50

Free sample on application

Consolidated Dental Manufacturing Company

DR. CHAS. A. DAVIS' Improved Cross-Bar Vulcanizer.

Patented, March 20, 1894



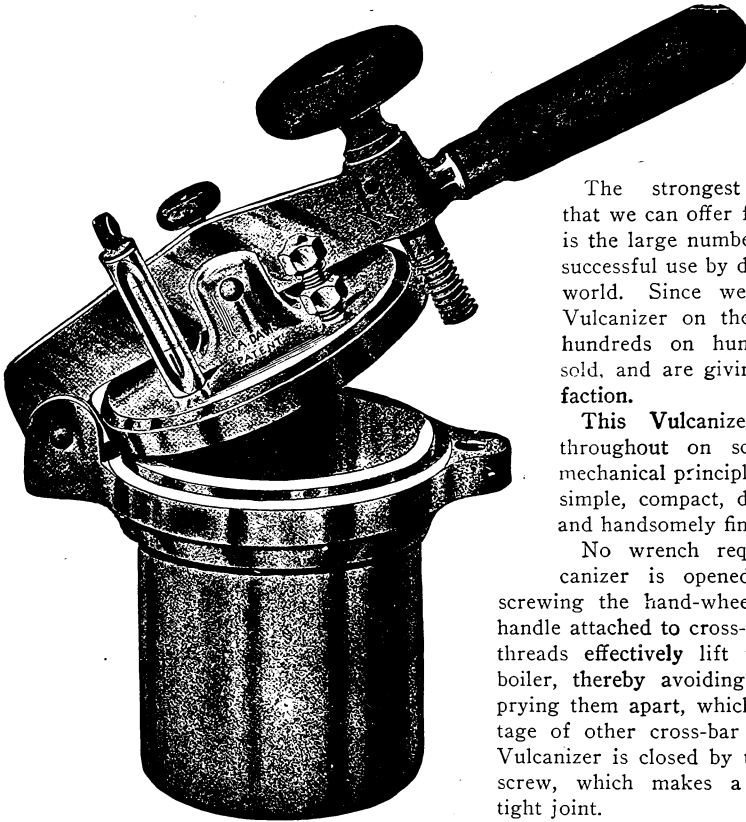
Catalogue
595
 Number.

PRICES.

2-Case Vulcanizer, for Gas or Kerosene	\$20.00
2-Case Vulcanizer, for Gas.....	18.00
3-Case Vulcanizer, with Gas Regulator and Timing Attachment.....	28.00
2-Case Vulcanizer, with Gas Regulator and Timing Attachment.....	26.00
3-Case Vulcanizer, with Steam Gauge	24.00
2-Case Vulcanizer, with Steam Gauge	22.00

Dr. Chas. A. Davis' Improved Cross-Bar Vulcanizer.

(CONTINUED.)



The strongest recommendation that we can offer for this Vulcanizer is the large number that are now in successful use by dentists all over the world. Since we first placed the Vulcanizer on the market in 1897, hundreds on hundreds have been sold, and are giving universal satisfaction.

This Vulcanizer is constructed throughout on scientific and best mechanical principles. It is extremely simple, compact, durable, well-made, and handsomely finished.

No wrench required. The Vulcanizer is opened by simply unscrewing the hand-wheel and lifting the handle attached to cross-bar. The two last threads effectively lift the lid from the boiler, thereby avoiding the necessity of prying them apart, which is the disadvantage of other cross-bar vulcanizers. The Vulcanizer is closed by turning down this screw, which makes a perfectly steam-tight joint.

Each Vulcanizer is regularly furnished with the Davis Improved Thermometer, a substantial Blow-off Valve and a Safety Valve. The Safety Valve contains a thin metal disk which will give way under excessive pressure of steam and thus prevent an explosion. When so ordered, our Gas Regulator, with Timing Attachment, or our special Steam Gauge, will be added, at extra cost indicated in list of prices.

The Boiler or Pot is seamless and extra heavy. The entire lower part below the lid is made in one solid piece, thus avoiding any opportunity for a weak joint or leakage if the collar were brazed to the pot, as in other cross-bar vulcanizers. The inside diameter of the boiler is $4\frac{1}{4}$ inches, sufficient to take the largest flasks, and is of sufficient depth to admit the Donham Spring.

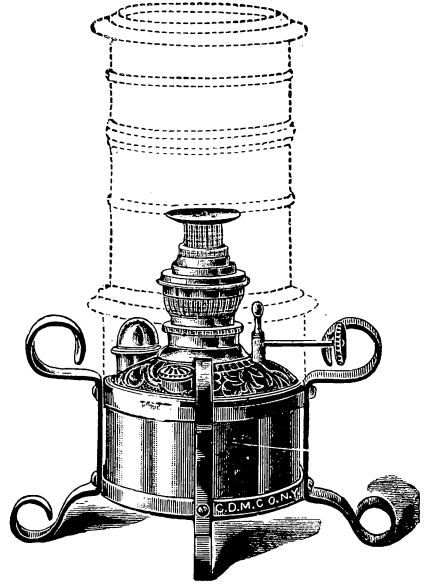
The cross-bar is made of extremely hard gun metal and is constructed on scientific principles, being heavily reinforced at the center, where the greatest pressure is exerted. The handle of the cross-bar is hard wood, of suitable size. It is securely fastened to the cross-bar by means of a bolt and blind nut, which is countersunk within the end of the handle, making it impossible to burn the hand grasping the same. The hand-wheel screw and tapered bolts which hold the bar to the boiler and lid to the bar are of the best cast steel. The wooden hand-wheel is securely fastened to the screw and can be operated without further protection from the heat.

Dr. Chas. A. Davis' Improved Cross-Bar Vulcanizer.

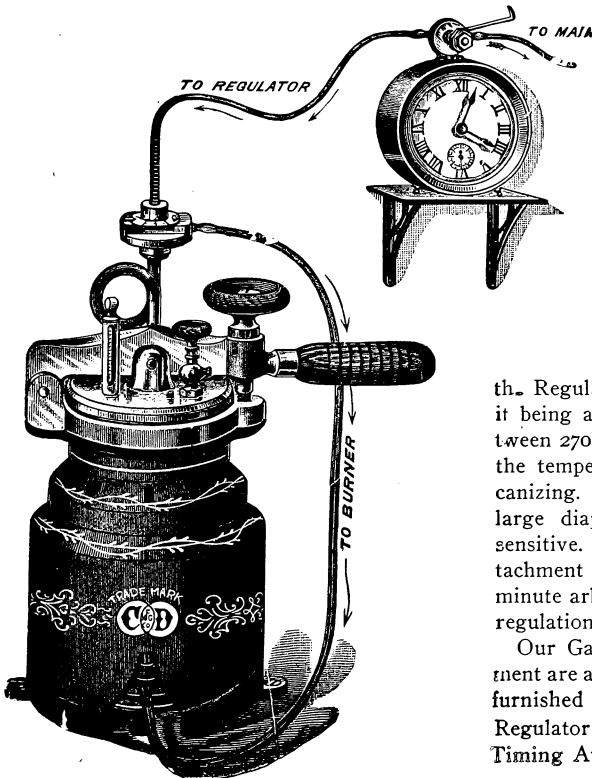
THE KEROSENE HEATING ARRANGEMENT.

We would invite particular attention to the unique kerosene heating arrangement as furnished with this Vulcanizer. It consists of an improved kerosene lamp, constructed on the standard center-draught principle. It gives intense heat and the flame can be regulated to a nicety. The oil reservoir has an indicator showing when it is full, and empty, which is an advantage when refilling. The iron stand is light, strong and of neat form. The jacket is made of sheet iron, and has an isinglass door convenient to the burner. This kerosene arrangement is a great improvement over anything ever before furnished for vulcanizers where gas is not used.

Price, \$4.00.



THE GAS REGULATOR.



We illustrate herewith the Davis Improved Cross-bar Vulcanizer fitted with our Gas Regulator and Timing Attachment. The Gas Regulator checks the flow of gas so as to hold the temperature of the Vulcanizer at the degree desired. The Timing Attachment shuts off the flow of gas at the right time. If a higher or lower temperature is desired

th. Regulator can be adjusted accordingly, it being adjustable to any temperature between 270° and 330°, this range comprising the temperatures applicable to dental vulcanizing. The Gas Regulator has an extra large diaphragm, rendering it extremely sensitive. The gas valve of the Timing Attachment is operated by the threaded minute arbor and is capable of very delicate regulation.

Our Gas Regulator and Timing Attachment are applicable to any vulcanizer and are furnished at the price of \$8.00.

Regulator	\$5.00
Timing Attachment	3.50

DESENSITOR

An Assistant, not an Obstacle

THERE is one feature about Desensitor that all dentists, seeking a reliable anaesthetic, should know about. Upon its injection, it desensitizes the tissues at once, efficiently and safely, with no ill effects upon the patient, *allowing the operator to proceed upon the extraction of the tooth or case in hand without further attention to the obtundent.*

Uncertainty about the effects of an anaesthetic naturally causes apprehension and a dentist's attention is divided between its administration and the extraction of the tooth. A dentist cannot do skilful work under such circumstances. There is no uncertainty about Desensitor. It never fails. It is always safe. The toxic effects are nil. It does not cause sloughing of the gums. Its ingredients have antiseptic and restoring properties favoring the prompt healing of a wound.

Knowing this about Desensitor, an operator's whole attention can be directed to the extraction of the tooth. Desensitor is an assistant, not an obstacle, and there is no other local anaesthetic with which a dentist can work so confidently.

PRICES.

1 ounce	\$1.00
2 ounces	2.00
6 ounces	5.00

*Confidence
Begets
Confidence*

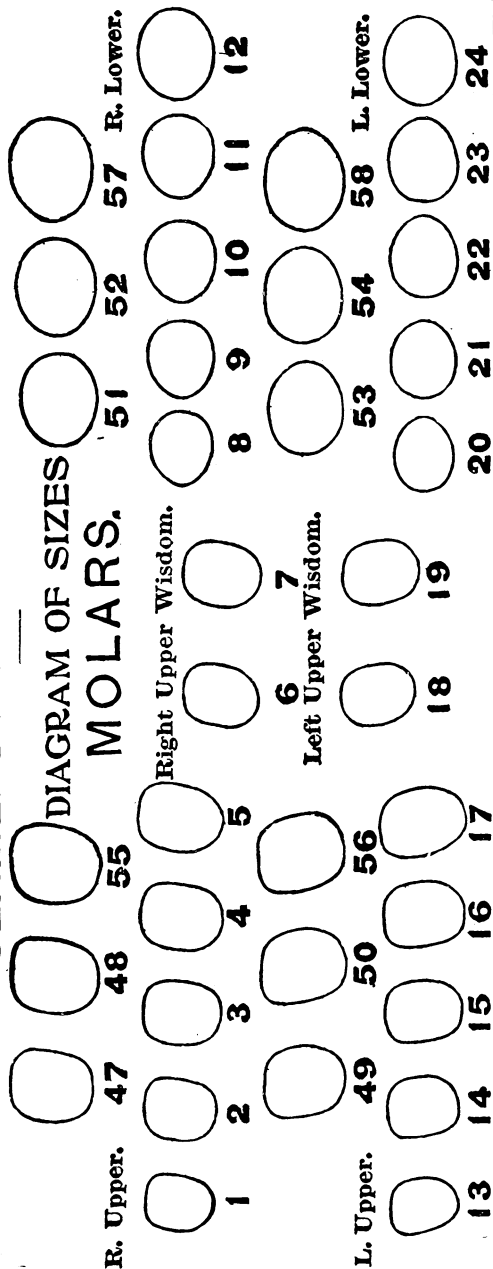
We will give you an all-metal hypodermic syringe free with your first order for six ounces, if requested.

CONSOLIDATED DENTAL MFG. CO.

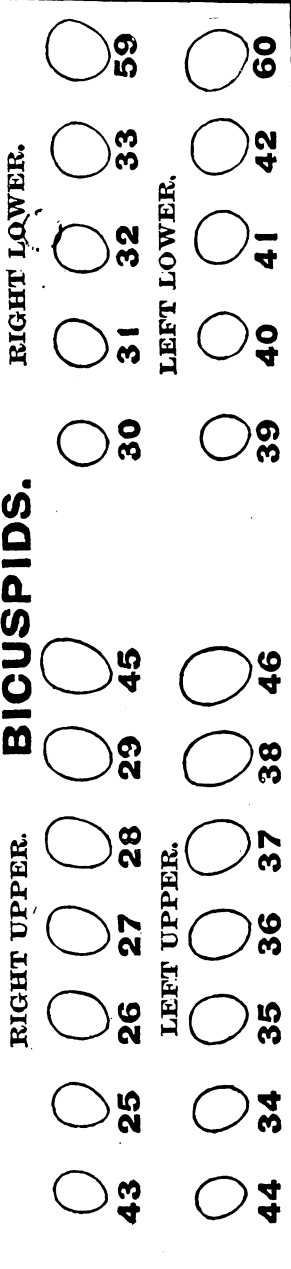
SEAMLESS GOLD CROWNS

Order by Number

SEAMLESS GOLD CROWNS



BICUSPIDS.



NOTE:—To find the size desired, take a piece of fine binding wire and place it around the neck of the affected tooth, and by twisting firmly connect the two ends. Then carefully remove the wire and place it upon the diagram under the head of the tooth required, and select the one nearest approaching it in size, and order accordingly, stating number.

Seamless Gold Crowns

These crowns are our own make, and are warranted 22k. gold. In form and contour they are faithful counterparts of perfect natural teeth of their respective classes.

By making our crowns of adequate length, we have overcome the principle objection heretofore offered against the use of ready-made crowns, and with the large assortment we offer, the unusual as well as customary cases are satisfactorily provided for.

The diagram on opposite page shows the exact size of the respective crowns, at the neck. To ascertain the crown desired, place a piece of binding wire around the neck of the tooth; tighten by twisting the ends of the wire; remove from tooth, compare with diagram and select nearest size. Specify by number.

We furnish a complete assortment of the crowns in hand—some case, there being 36 molars and 24 bicuspsids, as the diagram illustrates.

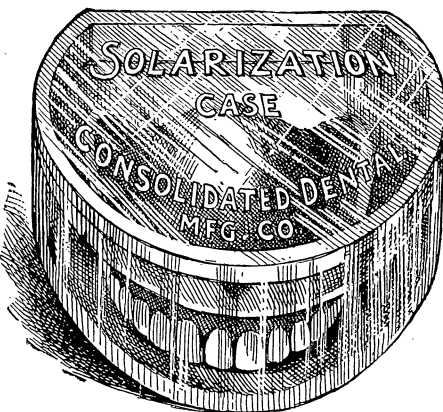


Solarization Cases



For the proper development of that desirable bright, rich color of dental rubber (particularly pink rubber).

Solarization cases are made of heavy flint glass with neatly fitting lid and of proper shape to produce the best results, and the rapid evaporation of the alcohol is avoided.



Inside dimensions.	Price.
No. 582 A—3½ x 2¼ x 1 in.....	26c.
No. 582 B—3½ x 2¾ x 9/16 in.....	35c.
By Mail, additional.	
Large Size.....	19c.
Small Size.....	12c.



A denture of pink rubber submerged in alcohol placed in one of these Solarization Cases and exposed for a short time to the light of the sun will have a beautiful pink shade closely resembling the natural color of the gums.



No other modelling composition has ever been in such large demand. It has become a requisite throughout the profession. . .

— THE NAME —
Consolidated Dental Mfg. Co.

CARRIES WITH IT THE STRONGEST
KIND OF A
GUARANTEE

The quality, price and superior properties have gained lasting popularity for this composition. . . .

Price per pound, 75 cts. By mail, 8 cts. extra per half pound, for postage



Catalogue No. 560

This Dental Modelling Composition does not "crawl," and it is entirely free from the sticky properties that characterize other preparations of similar name. ✻ ✻ ✻ ✻ ✻ ✻ ✻ ✻
After the impression is taken there is not the least shrinkage or expansion. ✻ ✻ ✻ ✻



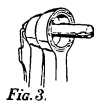
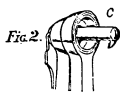
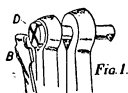
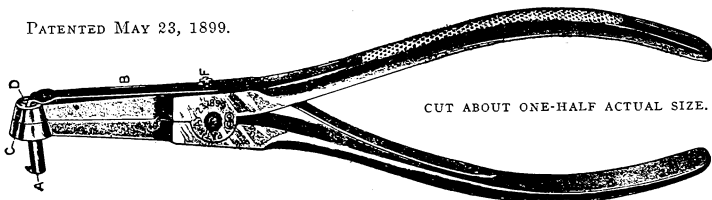
Crown

Slitters

These forceps are entirely unique and superior to any other appliance on the market for removing gold crowns. The small knife blade point is inserted under the cervical edge and the plier rim is rested upon the occlusal end of the crown. Then by simply compressing the handles of the forceps the crown is easily slit lengthwise. In this way a crown or bridge anchorage can be readily and neatly removed and the slit crown replaced if wished, by soldering the slit edges of the crown after bringing them together. The great advantage of this slitter is the fact that by turning the knife, the front, side or rear of a crown may be slit with equal ease, and furthermore the point of the blade cannot slip off of the crown. All parts of the mouth can be reached with equal facility and without any danger of cutting the cheeks, as the rim prevents the knife from touching the cheeks, should it slip. Extra knives can be procured at a small cost should they become dull.

PATENTED MAY 23, 1899.

Catalogue
653 A
Number.



The knife, "A" is to be inserted under the cervical edge of the crown and the rim "C" rested upon the occlusal end of the crown. By lifting the spring "B" the knife may be turned in any position so as to cut any part of the crown or reach any tooth with equal facility. The slit "D" in the top of the knife piece prevents it from turning. The knife piece can be taken out or replaced by lifting the spring "B" and turning it on Fig. "F."

This forcep is made so that it can be taken apart easily and each piece thoroughly cleansed and rendered aseptic.

Figs. 1, 2, 3, 4 and 5 show the different positions of the knife.

PRICE COMPLETE, \$3.50

EXTRA KNIVES, - - .50

Consolidated Dental Mfg. Co.,

115 WEST 42d ST., NEW YORK, U. S. A.

Crystalloid Gold

It is Pure Gold only, manufactured by a Novel Process

CRYSTALLOID GOLD is Plastic Gold, between layers of Gold Foil. This combination makes the best known form of Gold for filling. The Foil supplies what the Plastic Gold lacks, namely, fiber and tenacity. The Plastic Gold supplies what the Foil lacks, namely, adaptation and freedom to move before the point of the instrument.

IT SPREADS Laterally under the plugger, thus enabling the operator to more easily start fillings in shallow cavities without retaining points and to more quickly fill all cavities, especially those difficult of access. For commencing fillings, whenever practicable, put in enough gold to fully cover the bottom of the cavity, and then force it directly down without any effort to carry it sideways. If sufficient gold has been used it will wedge at once.

Whether used inside of a cavity, or in building, it has a tendency to make a level surface, thus obviating care in placing each piece in exact position.

It finishes finely with gold edges and smooth, hard surfaces.

There is in filling many cavities a great saving of time. Some operators say they have saved one-half of the time usually required, while some have made stronger statements. It is, however, requested that care be used to condense perfectly, as the tendency will be to pack this gold too fast, because it packs easily.

It can be used to advantage with hand pressure, especially in frail cavities, to which it is well adapted, or it can be used with the mallet, which is preferable in contours and surfaces.

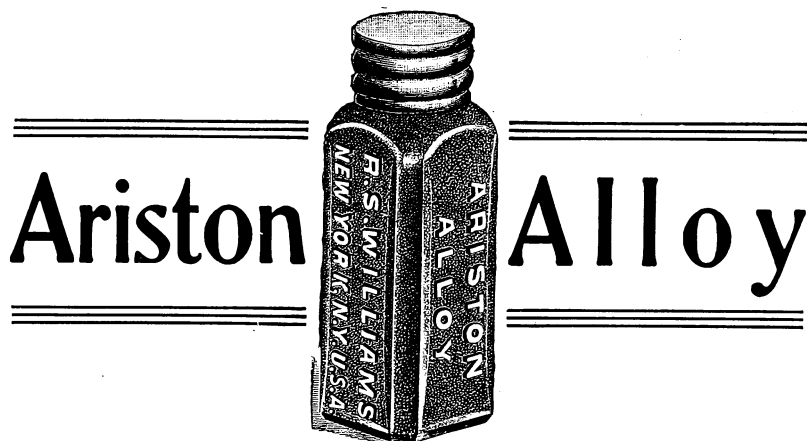
There is little waste in using this gold, and after a little experience in handling, the operator will not waste more than with other preparations. In this respect it has a marked advantage over the Plastic Golds, which have been tested during the past twenty years.

It can be sent any distance without injury.

Crystalloid Gold has been fully tested by first-class operators, who have highly recommended it.

Price, 1-8 ounce, \$4.50; 1-2 ounce, \$17.00; 1 ounce, \$34.00.

Consolidated Dental Mfg. Co.



Ariston Alloy

Another High-Grade Production of

R. S. WILLIAMS

Like all the other articles bearing R. S. Williams' name, Ariston Alloy is noted for the purity of its ingredients and the care exercised in preparing it for use for the dental profession.

This Alloy for Amalgam has the best average of desirable qualities and is thoroughly reliable.

It mixes well either in the hand or mortar, forming a smooth plastic. *Thorough mixing is very important.*

The working quality is excellent, because this alloy is not injured by using enough mercury to produce *complete amalgamation*. Equal parts, by weight, of filings and mercury give the best results. There is no need to use the Amalgam made of this Alloy so dry that it crumbles and is troublesome to use in cavities difficult of access; in fact it spreads better under the instrument and unites better when there is just enough mercury to make a plastic, cohesive ball, but not so much mercury that it can be readily squeezed out by pressure between the thumb and fingers. When used too dry, the Amalgam is liable to bridge over like cohesive gold, leaving pit holes which cause leakage.

The Amalgam sets well, making a hard filling with strong edges.

When properly worked the absence of shrinkage is a feature unapproached by any other Amalgam.

The color is very white. It stands very well in the mouth and the long continued use of this Amalgam for many years is a very conclusive test of its durability.

Ariston Alloy is made in the form of filings only; it is put up in ounce and half-ounce screw-capped glass vials.

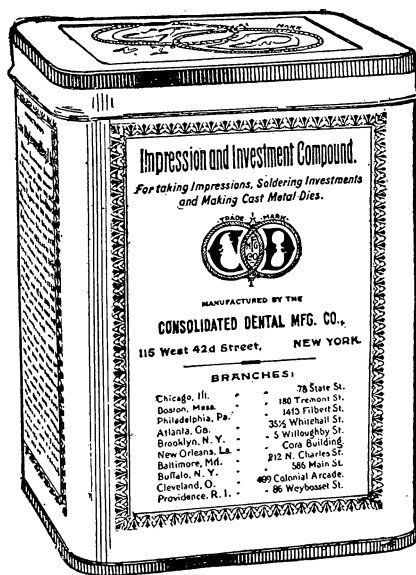
The price of Ariston Alloy is \$3.00 per Troy ounce; two ounces, \$5.50; four ounces, \$10.00.

Consolidated Dental Mfg. Company

CONSOLIDATED DENTAL MFG. CO.'S IMPRESSION AND INVESTMENT Compound.

For taking Impressions,
Soldering Investments
and Making Cast Metal
Dies. ♦ ♦ ♦ ♦ ♦ ♦

Its smooth-
ness permits
its spread-
ing evenly
and freely
into the
spaces be-
tween the
teeth or fis-
sures in the
crowns, over-
coming all
the annoy-
ance incident
to the use of
plaster. . . .



It DOES
NOT AD-
HERE to the
teeth, but
gives an
impression
of the mouth,
which, for
evenness of
surface and
glossy ap-
pearance,
surpasses
anything that
can be ob-
tained with
plaster. . . .

This compound will be found in-
valuable as a substitute for plaster for
impressions, etc., being superior
in many respects, ♦ ♦ ♦ ♦ ♦ ♦

Put up in neat tin cans. Price
per can, about one quart or
two pounds, 25 cents.
Large size can, containing
ten pounds, \$1.00. ♦ ♦ ♦

It is especially advantageous for soldering invest-
ments and making cast metal dies. The finished
die made from this compound shows EVERY
LINE, TOOTH and UNDERCUT, SHARP, DIS-
TINCT and SMOOTH. ♦ ♦ ♦ ♦ ♦ ♦ ♦ ♦

Crescent Alloy

PRICE PER OUNCE, \$1.50



CRESCENT Alloy is a combination of metals mainly silver and tin mixed in such proportions as to give the most desirable results. It is a strong alloy which expands slightly in setting, sufficient to insure a permanent position in the cavity. It has a silver-white color, which it retains. Put up in shavings or filings in bottles holding one ounce.

MANUFACTURED BY THE

Consolidated Dental Mfg. Co.

115 West 42d Street, New York

BRANCHES:

Chicago, Ill.	Philadelphia, Pa.	Brooklyn, N. Y.	Baltimore, Md.
	Detroit, Mich.	Boston, Mass.	
Atlanta, Ga.	New Orleans, La.	Cleveland, O.	Buffalo, N. Y.

“R
E

Are your Burs Dull?

A

Are you using irregular, soft, stone-cut burs that get dull quickly and fit badly in the handpiece? Probably you won't realize that you are until you try “REALIZATION” BURS and notice the striking difference and their superior working qualities.

L

Almost all the burs that the profession has contended with so long are hand made, and there has never been anything better before this to show how crude such burs are. One trial of “REALIZATION”

I

BURS proves quickly how inadequate and old-fashioned hand made burs are and how badly handicapped the dentist is who uses them.

Z

“REALIZATION” BURS are perfect, because they are made by machine. No others approach them in the accurate position of the blades, and the razor edges are in the exact circumference of a circle and equally distant from each other. The fine, hard quality of the steel produces a remarkable cutting edge, which is preserved by the high temper.

A

T

“REALIZATION” BURS don't grind; they cut tooth structure. It is absolutely impossible to produce these results in a bur made by hand, for in the outset no human eye is accurate enough to measure the dimensions of so small an instrument with regularity. “REALIZATION” BURS outlast all other styles, and every dentist appreciates the economy of using a bur with lasting properties.

I

Be sure to get the
SEALED Package
and thus avoid
Substitutes

O

N”

Our improved machines and the great quantity of burs produced enable us to quote the following low prices.

Nos. ½ to 7; 11½ to 18; 22½ to 29; 33½ to 40; 44½ to 51; 55½ to 62; 62½ to 73; 88½ to 95, per doz.	\$1.00
Half Gross	\$5.50. Gross \$10.00
Nos. 8 to 11; 19 to 22; 30 to 33; 41 to 44; 52 to 55; 63 to 66; 74 to 77; 96 to 99, per doz.	\$1.50
Half Gross	\$8.00. Gross \$15.00

We are at present ready to supply at once burs of the following numbers:

Round	.....000, 00, ½, 1, 2, 3, 4, 5, 6, 7.
Wheel	.....000, 00, 11½, 12, 13, 15, 16.
Inverted Cone	.....000, 00, 33½, 34, 35, 36, 37.
	½ doz. of a size in a package.

B

U

R

Consolidated Dental Mfg. Co.

S

The Triggs Dental Charts.

A Modern Card Index System of

DENTAL BOOKKEEPING.

It affords easy and rapid reference to all accounts, no matter how old; is simple in construction and inexpensive. We carry three styles of charts and can make special forms to order. Prices for stock charts, including case and index:

\$6, \$8, \$10 and \$12.

Write us for samples and any further information desired.

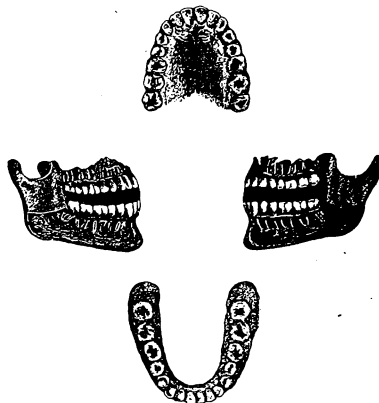


CHART NO. 1.

THE TRIGGS SYSTEM OF DENTAL CHARTS may be ordered from the Consolidated Dental Mfg. Co., Sole Agent, at its home office, No. 115 W. 42d St., New York; from its branch houses in Boston, Providence, Brooklyn, Buffalo, Philadelphia, Baltimore, Atlanta, Chicago, New Orleans, and from any of the Company's agencies throughout the U. S. and Canada, and foreign countries.

CRESCENT PEPPER PADS



CRESCENT Pepper Pads are valuable in cases of Regulating, Wedging and Crowning, and in operations where gentle and persistent stimulation is essential. A Crescent Pepper Pad properly placed in position removes the pain and tenderness. Crescent Pepper Pads are very thin, and having a packing of white rubber, are waterproof and do not crumble. Crescent Pepper Pads, properly manipulated, will adhere to the gum where other capsicum plasters fail.

Crescent Pepper Pads are carefully packed in decorated tin boxes, each box containing nine dozen of the pads and a quantity of envelopes, upon each of which envelopes is printed complete directions for their use by the patient.

The Best Antiseptic for both Internal and External Use

LISTERINE

LISTERINE promptly destroys all odors emanating from diseased gums and teeth, and, by internal use, the foul gases from the stomach—an advantage the dentist will especially value for the relief of nervous dyspepsia during the treatment of the teeth. It is a *perfect tooth and mouth wash*, non-secret and professional, and therefore has received the highest recognition as the best general antiseptic for a dentist's prescription

"LISTERINE is the strongest and safest of the antiseptics which are available for the prophylactic treatment of the oral cavity."—Miller.

FOR the patient wearing bridge-work or artificial dentures, and as a daily wash for the preservation of the teeth, Listerine is freely prescribed by many successful practitioners, who are aware that too often the skill of the dentist is questioned when the real cause for dissatisfaction is due to the patient's negligence in properly caring for the teeth and mouth

Lambert Pharmacal Company,
ST. LOUIS, U. S. A.

"The Dentist's Patient" and "Listerine in Dental Practice," two interesting pamphlets for the dental practitioner, may be had upon application to the manufacturers of Listerine.

WANTS. FOR SALE ETC.

NOTE.—Rate for advertising in this department of ITEMS OF INTEREST is ten cents per word, including captions, "Wanted," "For Sale," etc., and address. Initials charged as words. Advertisements should reach us by the 30th of each month to insure insertion in the following month's issue, and are payable in advance.

CONSOLIDATED DENTAL MFG. CO., Publishers, 115 W. 42d St., New York, N. Y.

- 3262—FOR SALE.—Three months later a reliable \$3,500 practice for \$700 in typical western railroad town. Small competition. The proposition will bear any inspection. Good reasons for selling. None but reliable parties with cash need write. Best of references. Address "D," care "Items of Interest," No. 115 W. 42d St., New York.
- 3263—FOR SALE.—Advertising office in Ohio city 30,000, doing \$4,000 cash. A rare chance; will stand investigation. Owner going to Europe; price \$1,500 cash. Address "EUROPE," care "Items of Interest," No. 115 W. 42d St., New York.
- 3264—THE NEW ENGLAND DENTAL AGENCY, Hartford, Conn. Established 1893, will sell your office quickly. Send for list of offices for sale. Positions for competent men.
- 3265—FOR SALE AT ONCE.—Modern up to date office and practice at invoice price; easy terms; best reasons for selling; best city in Montana; fine climate. Don't write unless you mean business. Address "MONTANA," care "Items of Interest," No. 115 W. 42d St., New York.
- 3266—FOR SALE.—Five thousand cash practice in fifteen thousand city Southern Kansas. Gas, oil and coal region. Fine office; two chairs. Price two thousand, time and cash, or would sell half interest. Address "KANSAS," care "Items of Interest," No. 115 W. 42d St., New York.
- 3267—FOR SALE.—\$2,000 cash practice and dental outfit in a growing Maine town; price \$400. Address "ILL HEALTH," care "Items of Interest," No. 115 W. 42d St., New York.
- 3268—FOR SALE.—Dental practice, very cheap. Address Lock Box 646, Erie, Pa.
- 3269—WANTED.—Good operator with Swiss Federal Dental Diploma can hear of exceptional opening by addressing me. All around man for Cape Colony, South Africa. Two years contract; second class passage paid out from New York. State salary expected.
Exceptional opening in South American city for a good porcelain and crown and bridge worker. Large salary. Two years' contract.
- Practices for sale; positions. Send for complete list.
CHAS. R. HAMBLY, D. D. S.,
Confidential Broker,
Bradford Pa., U. S. A.
- 3270—FOR SALE.—Twenty-five hundred dollar cash practice southern Wisconsin town of six thousand. Established twelve years. Box 284, Sharon, Wis.
- 3271—POSITION wanted by experienced graduate. Address "L," care Southern Dental Supply Company, Washington, D. C.
- 3272—WANTED.—A1 man registered in Pennsylvania; full particulars first letter. Address No. 12, care "Items of Interest," No. 115 W. 42d St., New York.
- 3273—WANTED.—Hundred practices for ready buyers; sell on commission; lists for stamp; assistants furnished free. NATIONAL DENTAL AGENCY, Lima, Ohio.
- 3274—WANTED.—Position by lady graduate. Address "MISS WILLIAMS," care "Items of Interest," No. 115 W. 42d St., New York.
- 3275—WANTED NOW.—Partner with \$300 to \$500 cash. Single. Crown and bridge builder. References. DR. ABIEL BOWEN, Medina, N. Y.
- 3276—FOR SALE.—Established private practice, Delaware town, convenient to Philadelphia. Business October \$450. Equipment amounting to \$750, with practice for that amount cash. Address Room 2, 1317 Real Estate Trust Bldg., Philadelphia.
- 3277—FOR SALE.—Practice and latest outfit (Columbia Chair Favorite 11); city over 30,000; State New York; \$400 cash; changing professions; must sell by February first. Address "ANXIOUS," care "Items of Interest," No. 115 W. 42d St., New York.
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- 3279—FOR SALE, NEW YORK STATE.—Practice and outfit in country town doing good business, at value of outfit alone. Address No. 3,279, care "Items of Interest," No. 115 W. 42d St., New York.

Wants, For Sale, Etc.—(Continued.)

- 3280—WANTED.—Two operators; two laboratory men. NATIONAL DENTISTS, Knoxville, Tenn.
- 3281—WANTED.—Partner in advertising business. Box 361, Louisville, Ky.
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- 3285—WANTED.—Expert contractor. One all around man. DR. WORSTER, Omaha, Neb.
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- 3288—SITUATION WANTED.—Graduate University of Pennsylvania, registered Pennsylvania and New Jersey, wants position as operator. Speaks Spanish. Address No. 3288, care "Items of Interest," No. 115 W. 42d St., New York.
- 3289—FOR SALE.—Dental chair and cabinet and dental instruments and tools; such as you may select. Practice thrown in. Finest town and location in Western Pennsylvania. Address No. 3289, care "Items of Interest," No. 115 W. 42d St., New York.
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In a report made at the Academy of Medicine, Paris, March 29, 1898, published in The Bulletin Medical of March 30, 1898, Prof. Reclus stated:

"Beta-Eucain possesses a number of undoubted advantages. In the first place, its solution can be boiled without undergoing decomposition, thus permitting it to be sterilized by heat. This cannot be done with cocaine.

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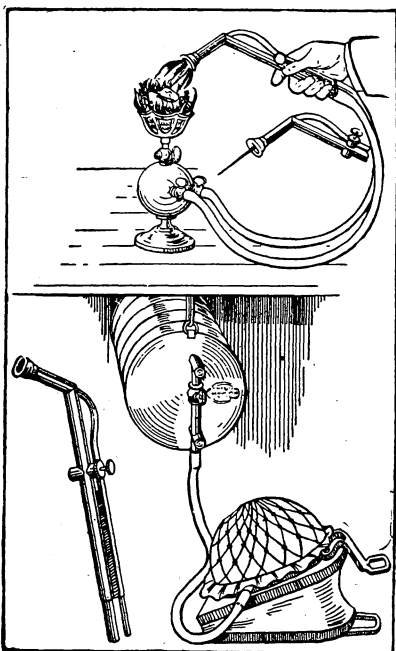
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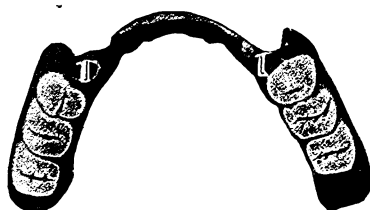
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only a fraction of its real
value.

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or keepsake, than a **Laughlin
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is ever ready, ever handy, and
ever suggestive of the fact
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**No Teeth Posterior to
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The Griswold attachments will hold
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This system allows the denture to
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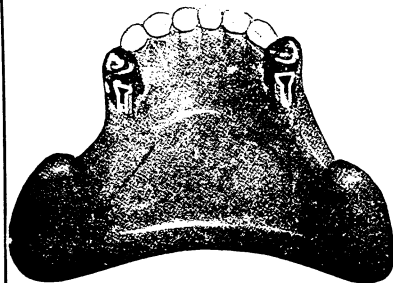
The attachments may be reversed,
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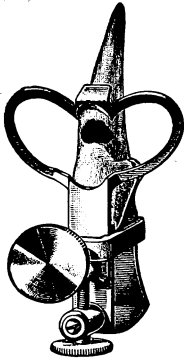


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IVORY'S Improved Adjustable CLAMP

PATENTED OCTOBER 10, 1899.



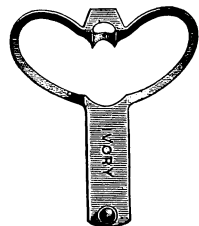
THE great advantage of this Clamp, where it surpasses all others, is that the labial jaw is forced by screw pressure, carrying the rubber dam and gum in advance of the jaw, thus exposing the cavity and keeping it dry for the operation.

INSTRUCTIONS

First place on the tooth the rubber-dam "ligature" with a proper instrument, press the ligature well up on the palatal neck. Then apply the clamp, taking care that the palatal jaw catches above the margin of the enamel beyond the bulb of the tooth. Tighten the yoke screw, having both the labial and palatal jaws below the ligature. After the clamp is thus adjusted cut ligature, turn the horizontal screw to the left, forcing the labial jaw to sufficient distance above the cavity. As this jaw advances to the lesser diameter of the neck, continue tightening the yoke screw so that neither the gum nor the rubber dam can slip under the jaw of the clamp. Remove by loosening the yoke screw when the natural spring of the clamp releases the jaws from the tooth.

The Jaws (LARGE AND SMALL) are Interchangeable

Price of Clamp, with Large or Small Jaw	\$2 50
Price, including Both Jaws	3.00
Price, Either Jaw Separate	.50



J. W. IVORY

51 North Tenth Street

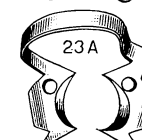
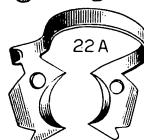
PHILADELPHIA

Partial List of **IVORY'S MOLAR CLAMPS**

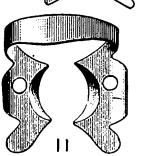
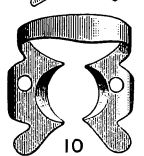
Different Sizes and Form



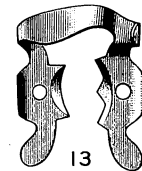
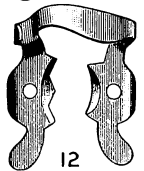
Nos. 22 and 23, right and left, are adapted to second superior molars and child's first molars, buccal and other cavities. Price per pair, \$1.60.



Nos. 22A and 23A, right and left, are adapted for first superior molars and large size second superior molars and third inferior molars. Price per pair, \$1.60.

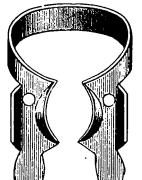
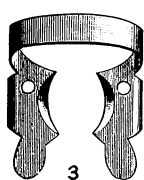
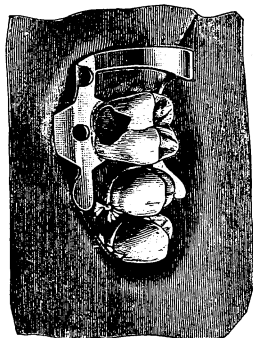


Nos. 10 and 11 are Right and Left Inferior Molar Clamps for all small molar teeth; also child's first molars. The bow of this clamp is extremely low. Price per pair, \$1.60.



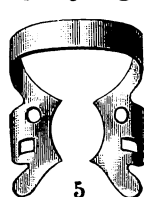
Nos. 12 and 13 are designed for buccal cavities, those peculiar saucer-shaped cavities in first and second inferior molars; used with Rubber,

Holding the Gum and Rubber Dam; well out of the way of operation. Price per pair, \$1.60.



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No. 56, designed as an Inferior Molar Clamp; general use; stiff spring. Price, 80 cents.

SEND FOR CLAMP CATALOGUE

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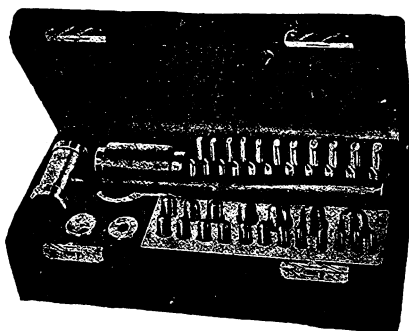


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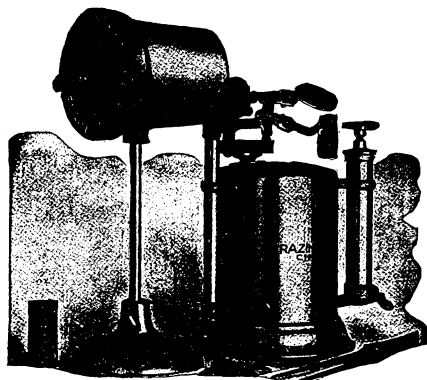
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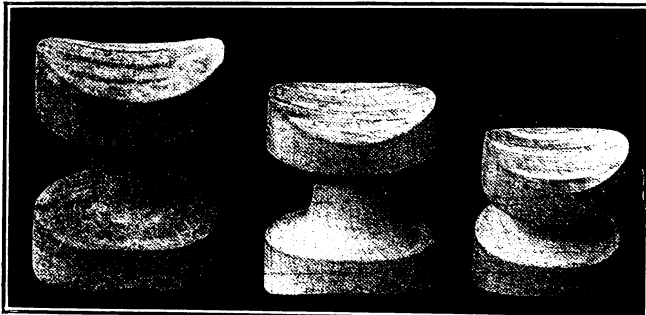
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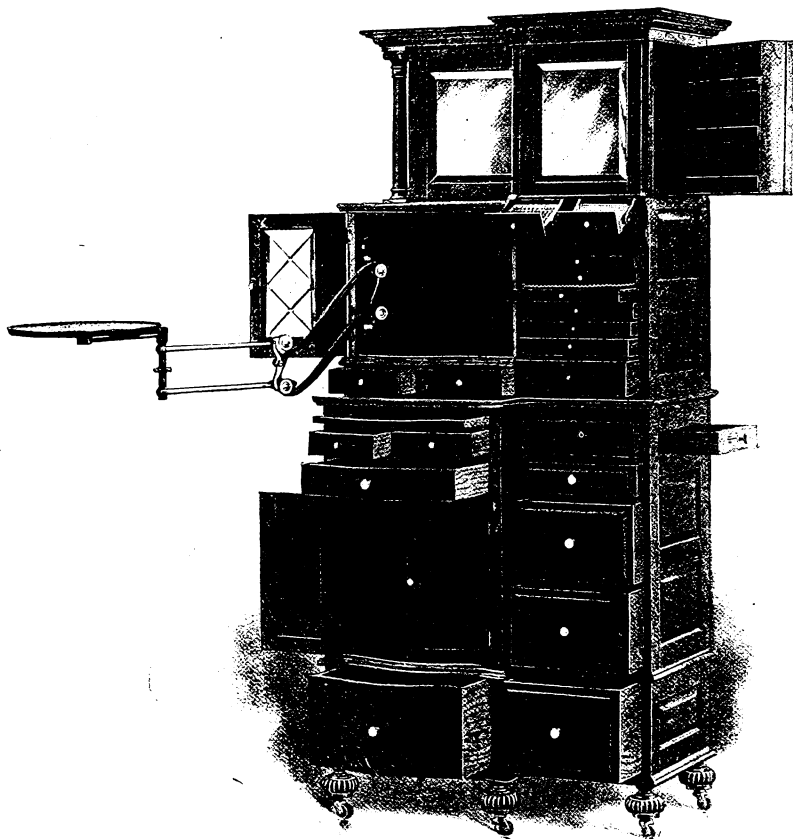
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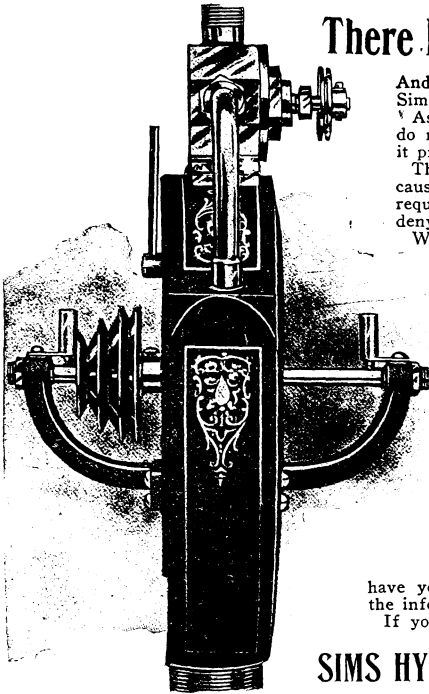


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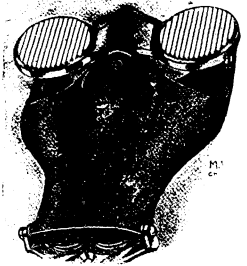
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If you leave it until to-morrow you may forget it.



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Single Bottles, \$1.50 Each

If interested in Porcelain work let us send you free specimens.

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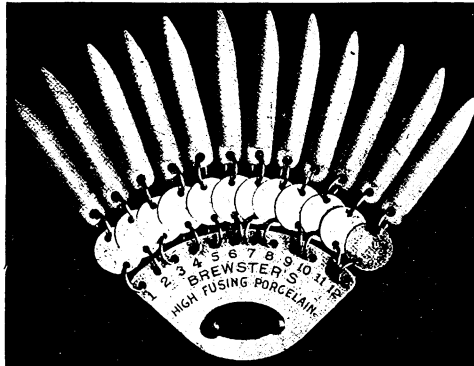
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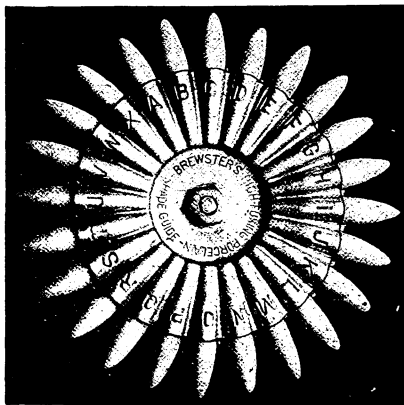
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FUSING PORCELAIN

LAIN WORKERS IN THE U. S. AND CANADA

WHEN buying a Porcelain outfit it is well to buy one that has received the endorsement of porcelain experts throughout the country. IT WILL SAVE YOU BOTH MONEY AND DISAPPOINTMENT.

The "Enamel Body" (of which these points are composed) has been repeatedly tested on the Dynamometer and found to register the same resistance to fracture as the best porcelain teeth



BREWSTER'S
NEW SHADE
GUIDE forming
part of his outfit of
27 bottles

Price
Complete
\$12.50

For dealing with a large variety of shades, this is the most convenient form of Guide yet devised. It is light, compact, composed of nothing but aluminum and porcelain; may be thrown into the sterilizer and boiled. The shades are all in view at once, and by rotating opposite the teeth in the mouth, the correct shade is readily found. The points may be passed between the teeth.

HIGH-FUSING OIL COLORS, for use in Inlay Work, for changing the Color of Facings, Rubber Sets, etc.

Complete outfit, large size, \$8.00

Complete outfit, small size, \$5.50

FOR SALE BY DENTAL HOUSES AND BY THE MANUFACTURERS

The Brewster Dental Co.

2544 Princeton Ave.
... CHICAGO

The PAYNTER-WATSON ELECTRIC DENTAL AND DIAGNOSTIC LAMP

is not a luxury but

== A NECESSITY ==

Such is the opinion of those who are using it. It is different in principle from all other dental lamps and has

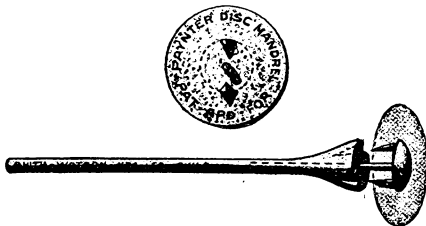
PROVED TO BE THE BEST

**IF YOU ARE A USER YOU KNOW ITS VALUE
NOT LET US PROVE TO YOU**

We have just perfected an appliance by which the Paynter-Watson Lamp can be used with street current in a satisfactory manner and be under perfect control.

We also have a storage battery outfit which gives better satisfaction than dry batteries do.

—Write for Particulars—



**The Paynter
Disc Mandrel**

Patented October 14th, 1902

Why pay fifty or seventy-five cents for other mandrels when you can get THE PAYNTER DISC MANDREL For **35 cents each or 3 for \$1.00.**

Nine users out of ten like the Paynter Mandrel better than the more expensive kind.

Made entirely of non-corrodible metal, nickel plated, and *being of only two simple pieces* is not likely to get out of order.

One movement to place head on or take it off. Faster it's revolved the tighter it holds. Can be revolved forward or backward.

SENT POSTPAID ON RECEIPT OF PRICE

SMITH-WATSON MANUFACTURING CO.
DENTAL SPECIALTIES

516 Odd Fellows Temple,

Philadelphia, Pa.

FOR SALE BY CONSOLIDATED DENTAL MFG. CO.

THE JAEGER DENTAL LAMP

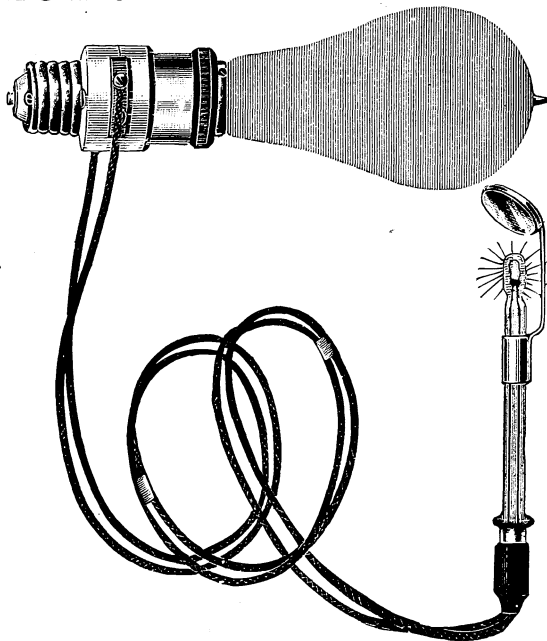
OPERATED DIRECTLY
FROM STREET CIRCUIT

**Our
New
Departure**

**A Light
That Never
Fails**

**Practical
Economical**

**Reliable
and
Aseptic**



**Your
Leading
Dental
Houses
Will
Have
Them on
Sale**

**Write
for
Circular**

Dr. Chas. A. Meeker, of Newark, N. J., writes us the following letter:

CHARLES A. MEEKER, D.D.S.,
29 Fulton St., Newark, N. J.

Sept. 23, 1902.

JAEGER MINIATURE LAMP CO.,
New York City:

DEAR SIR: I bought one of your lamps at the N. J. Exhibits' annual meeting of 1902. Permit me to say that it is the best I have ever been the possessor of. I have purchased many, the earliest in 1883, exhibited at the C. D. A. meeting in Newark. The care of the batteries and the vexatious delays of giving out, just when you most desired them, always made them a necessary evil.

This one seems to go as long as the street current continues.
You should bring it before the profession by advertising it.

Yours truly,

CHAS. A. MEEKER.

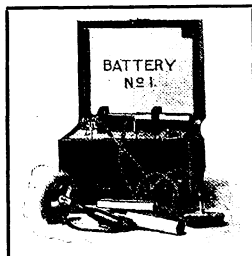
PROTECTED BY PATENT.

Originated, Manufactured and Introduced by the

JAEGER MINIATURE LAMP MFG. CO.,

Bible House, 8th St. and 4th Ave..
NEW YORK CITY.

Electricity, The Dentist's Friend



Our Dental Battery is indispensable to every dentist. With it you can immediately relieve Toothache, Neuralgia, after pain in extracting, and all pains of Head and Face. Extracting and Filling positively painless, in connection with any good local anaesthetic. With it you can quiet the nerves of nervous people and children. The current smooth, gentle, no shock. A treatise of all diseases and how to use it with each outfit. All parts nickel and in polished wood cabinet. The price is \$7.00 cash or C. O. D. We pay express. ❀ ❀ ❀ ❀

Our Gold Plating Outfit is unexcelled.

The ELECTRO MFG. CO., Columbus, O.



FOR

**Sterilizing the Mouth,
Teeth and Tongue.**

BAD BREATH.

Removing the Bad Taste of Medicines.

SOLD BY DRUGGISTS.

"Vegetol" is a compound that purifies the saliva and keeps it so by frequent use as a dentifrice. The menstruum, *pulverized cereal*, is a perfect cleanser, yet does not abrade. Its soda and potash neutralizes the acids of decay. Alkaline saliva arrests fermentative indigestion. Good in sickness and in health. Removes sordes.

THE VEGETOL COMPANY,

Send for sample, also booklet on the subject, containing formula.

11 E. Seventh St., CINCINNATI, O.

ROBINSON BRISTLE DISKS

For the Dental Engine

U. S. Patent, August 21st, 1900

AN IMPROVED CIRCULAR BRUSH

which is smaller and thinner and at the same time stiffer and stronger than any heretofore made.



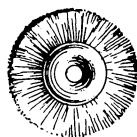
No. 11 STIFF



No. 9 STIFF



CUP SHAPE



SOFT POLISHING

The only device that will reach and polish that stronghold of tartar, the lingual surface of the lower incisors. :: Parts inaccessible to ordinary points and buffers are readily reached with these discs, and more effective cleaning and polishing can be done with them in five minutes than with usual devices in an hour.

Use the stiff brushes with pumice to clean the natural teeth and smooth fillings; the soft brushes with whiting or enamel restorer for polishing. The use of the soft brushes with whiting produces a polish on gold in the mouth that can be equaled in no other way.

CAN BE STERILIZED IN HOT WATER WITHOUT INJURY

Made in four styles as shown in cuts; all of finest French bristles with polished hubs. Each style packed on cards of one dozen each.

Price, 75 Cents per Dozen

CONSOLIDATED DENTAL MFG. CO.

Ames' SPECIAL

Crown and Bridge Cement was so named because it had been given a peculiar plasticity called for in such operations.

The fineness of texture resulting makes it the most durable and satisfactory oxyphosphate for fillings.

Several years' use of it, for all round purposes, has established this fact. ..

It is hydraulic to the proper degree, and its colors blend surprisingly with tooth structure.

Ames' Special Crown and Bridge Cement, \$1.35
Quick, Medium, Slow-Setting

Ames' New Process Oxyphosphate of Copper, 1.00—2.00

Ames' Original Oxyphosphate of Copper, 1.00

Ames' Metalloid Cement, in 15 Colors, 1.00—2.00

As a result of tests, Ames' Metalloid Cement was specified for U. S. Army dental service.

Samples sent on application.

W. V-B. AMES, 36 Washington St. CHICAGO



DR. R. B. WAITE'S LOCAL ANESTHETIC

Is guaranteed to please or money refunded

FREE Write us stating what anesthetic you are now using and we will send sample bottle free of charge.

U. S. Army Surgeon Lynde, of Buffalo, N. Y., says:

I have used Dr. R. B. Waite's Local Anesthetic extensively in general Surgery for several years with perfect results, even in some of the most painful operations. It will be found by anyone using it absolutely efficient and safe in all the operations for which Local Anesthetics are ever used. No unpleasant effects, local or general, need be feared.

U. C. LYNDY,
Formerly Surgeon in U. S. Vol. Army.

FREE An All-Metal or Glass Barrel Syringe upon receipt of your first \$5.00 order.

FOR SALE BY ALL DENTAL DEPOTS

PRICE: 1 OZ., \$1.00; 2 OZS., \$2.00; 6 OZS., \$5.00; 12 OZS., \$10.00;
20 OZS., \$15.00.

OR MAILED UPON RECEIPT OF PRICE

THE ANTIDOLAR MFG. CO., SPRINGVILLE, ERIE CO., N. Y.

FOR SALE BY CONSOLIDATED DENTAL MFG. CO.

THREE GENERATIONS OF DENTISTS

tried, tested and proved

PHÉNOL SODIQUE



It was best for the grandfather, best for the son, is best for the grandson. To-day its superiority is unquestioned.

No other antiseptic has so wide a range of usefulness. It is

ANTISEPTIC GERMICIDE
DISINFECTANT ANODYNE
ANTACID ANTIPHLOGISTIC
HEMOSTATIC and NON-ESCHAROTIC

Sample and literature upon request.

HANCE BROTHERS & WHITE

ESTABLISHED 1855

Pharmaceutical Chemists

PHILADELPHIA

NEW YORK

CHICAGO

PITTSBURG

LONDON

**A NEW
Dental Chair**

The Favorite

Columbia

Made in Two Styles

The No. 1 has a vertical range from 19 inches lowest position to 35 inches highest.

The No. 2 has a vertical range from 17 inches lowest position to 37 inches highest.

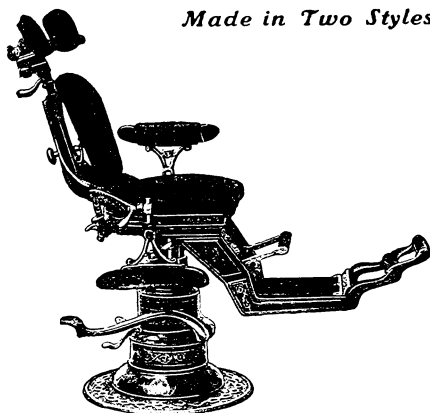
This latter is the lowest foot-operated chair on the market.

These chairs are very pleasing in appearance, and they afford the greatest convenience to the operator and equal comfort to patients.

They are devoid of useless novelties so often added simply for talking points.

Ours embody everything that is valuable and necessary.

Try them to see how easily you can raise a patient, and then try some other makes. You will quickly notice the difference.



The Columbia ELECTRIC DENTAL ENGINES

THEY ARE WORLD
RENOWNED

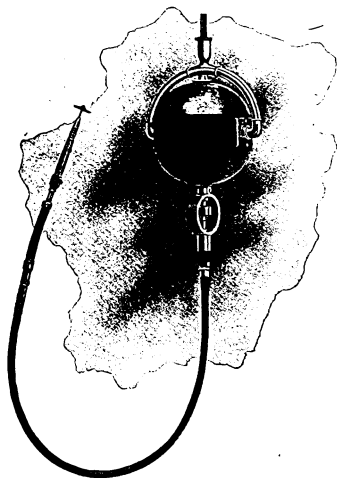
For either Direct or Alternating Current.

Investigation and comparison will prove to you that we manufacture the best and most successful Electric Dental Engines in the world, a claim which involves superiority in power, speed, ease of control, convenience, durability and beauty.

We guarantee our alternating current engines operate in all respects just the same as those of the direct current type; they regulate in speed in either direction of rotation, start and stop quickly and always respond promptly to every movement of the controller lever.

We know of no broader guarantee to offer. If we did, we would not hesitate to offer it.

You will never feel obliged to apologize for them as you might for some other. **They are noiseless. They are satisfactory. Always ready and never in the way. Our catalogue tells all about both chairs and engines.**



Type A. C. C. S. Alternating Current Engine. Suspended by counterweight from a neat bracket.

THE RITTER DENTAL MFG. CO.

**ROCHESTER
N. Y., U. S. A.**

Our Goods for Sale by all Dental Dealers

Abscessed Antrum

Is most successfully treated with a non-irritating ALKALINE antiseptic, that promotes osmosis, and gives a distinct alterative effect when applied to diseased tissue. This result is produced by

Glyco-thymoline

(KRESS)

It is especially indicated after extraction and other surgical wounds of the mouth. As a wash for Abscessed Antrum and a topical application in

Pyorrhoea Alveolaris

Its therapeutic action is unequalled.

SPECIAL OFFER :

A pound bottle of GLYCO-THYMOLINE (Kress) will be sent free to any Dentist who will pay express charges.

Mfg Chemists. **KRESS & OWEN CO.,** 221 Fulton St., NEW YORK.

Five-Grain
Antikamnia
Tablets
Are

No Friend to Pain

No Matter When - No Matter Where

(TWO EVERY THREE HOURS)

The Antikamnia Chemical Company, · St. Louis, U. S. A.

SOZODONT

Alkaline, Astringent, Antiseptic

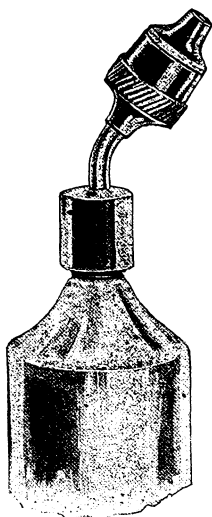
SOZODONT possesses the three characteristics which are generally conceded to be essential to a perfect dentifrice and mouth-wash. Its use in dental offices, not only as **A PLEASANT DEODORANT AND WASH**, but also as a remedial agent as well, is steadily increasing. Its alkaline reaction,—**A FEATURE OF PRIME IMPORTANCE** from a dentist's standpoint, though possessed by few of the many washes on the market,—is pronounced, though slight. As an astringent, its effect is mild, but marked. The antiseptic feature has recently received much attention and is now as near perfection as the efforts of experienced chemists can obtain.

We wish every dentist to **BE FAMILIAR WITH SOZODONT**. Samples for trial will be sent to any dentist in America, together with Professor Hill's and Professor Norton's Analyses of **Sozodont**, "Uses of **Sozodont** in Dentistry" and litmus for testing. We invite correspondence.

HALL & RUCKEL

Established 1848

NEW YORK CITY



Anodynone

CHEMICALLY PURE
ETHYL-CHLORIDE

A safe and reliable local anæsthetic in glass tubes with patented curved spray cap for dental use. Quality and odor superior to any on the market. Spray cap always under perfect and rapid control and *guaranteed* absolutely air-tight when closed, preventing leakage and evaporation.

PRICES

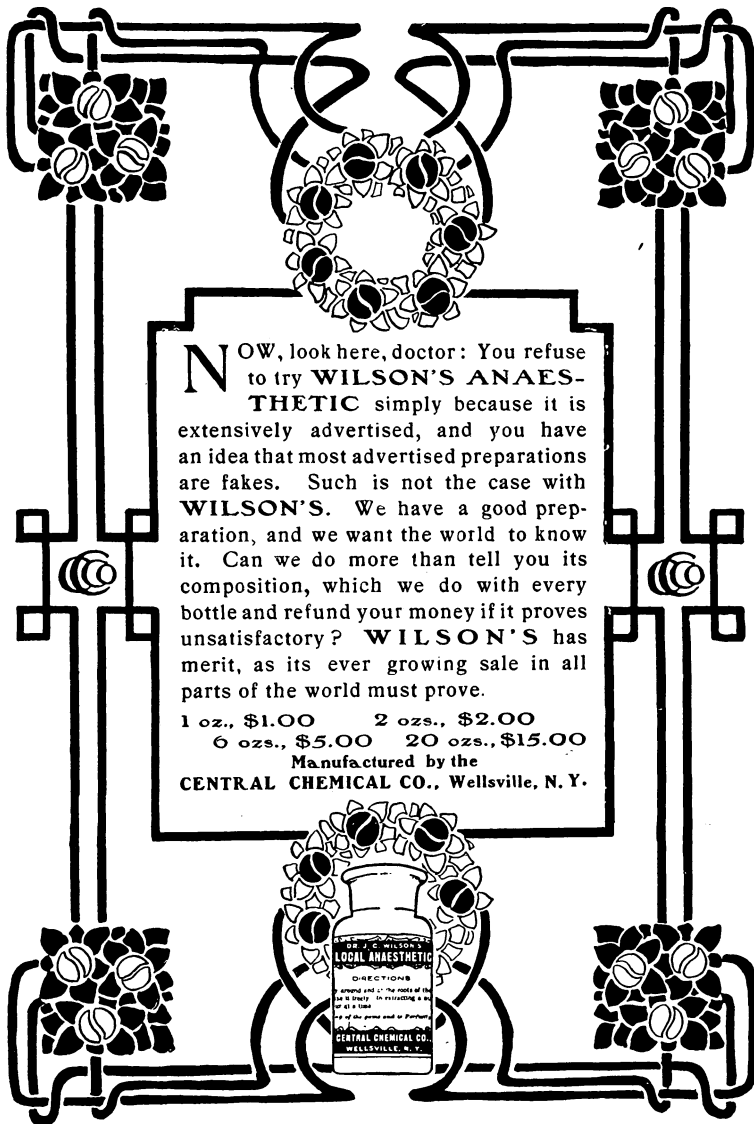
Single Tube, containing 30 grams	..	\$1.00
Single Tube, containing 60 grams	..	1.25

Further information cheerfully furnished

EAGLE CHEMICAL WORKS
SECAUCUS : : NEW JERSEY

For Sale by


CONSOLIDATED DENTAL MFG. CO.



NOW, look here, doctor: You refuse to try **WILSON'S ANAESTHETIC** simply because it is extensively advertised, and you have an idea that most advertised preparations are fakes. Such is not the case with **WILSON'S**. We have a good preparation, and we want the world to know it. Can we do more than tell you its composition, which we do with every bottle and refund your money if it proves unsatisfactory? **WILSON'S** has merit, as its ever growing sale in all parts of the world must prove.

1 oz., \$1.00	2 ozs., \$2.00
6 ozs., \$5.00	20 ozs., \$15.00

Manufactured by the
CENTRAL CHEMICAL CO., Wellsville, N. Y.



For Sale By

Consolidated Dental Mfg. Co.

ASTRINGENT
ANTISEPTIC

LAVORIS
TRADE MARK

DETERGENT
DEODORANT

**A PLEASANT AND VALUABLE PREPARATION FOR
DISEASES OF THE TEETH, GUMS, THROAT
AND MUCOUS MEMBRANE**

Non-Secret—An Ethical Formula

LAVORIS contains in a pleasant and permanent form the astringent properties of chloride combined with Cassia Zeylanicum and such antiseptics as Formaldehyde, Menthol, etc. It is an active astringent, strongly germicidal, detergent and deodorant.

LAVORIS is recommended for the treatment of PYORRHEA ALVEOLARIS and is especially valuable for treatment of surgical wounds of the mouth.

***"LAVORIS is invaluable in the treatment
of Pyorrhea."*—FREDERICK B. KREMER, D.D.S.**

FREE SAMPLE (express paid) to Dentists and Physicians

Its merits will be appreciated when it is understood that LAVORIS has the exceptional property of Zinc Chlorine in perfect solution.

LAVORIS Chemical Company

7 South Sixth Street, Minneapolis, Minnesota

NO COCAINE ANXIETY

TO the conservative practitioners, who do not use Local Anesthetics because of the many fatalities from the use of COCAINE and similar products—and to those who have been using COCAINE we introduce HELIOS—as it does away with the constant dread of a fatality which would ruin their professional standing. HELIOS is prepared from a new COAL-TAR product possessing the same Anesthetic qualities as COCAINE without any of the toxic effects of that dreaded drug. It can be used in any quantity without the least apprehension on the part of the practitioner.

HELIOS

NON-TOXIC

THE NEW LOCAL ANESTHETIC

A clear liquid of a pale pink color, being prepared from a newly discovered COAL-TAR product:

NO COCAINE
EUCALINE
CHLORETONE
MORPHINE
ATROPINE

DIRECTIONS: Inject freely around the tooth and extract immediately.

Caution: Have your needle and syringe aseptic. PACKED ONLY IN TWO-OUNCE VIALS.

Price, per 2-oz. vial.....\$ 1.50
Five 2-oz. vials 5.00

SOLE WHOLESALE AGENTS

THE MEIER DENTAL MFG. CO.
St. Louis, U. S. A. Hamburg, Germany

FOR SALE BY ALL DENTAL DEALERS

A Long Stride Toward Perfection

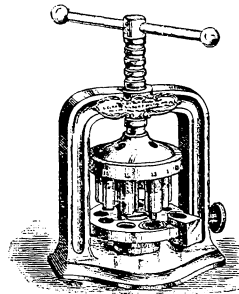
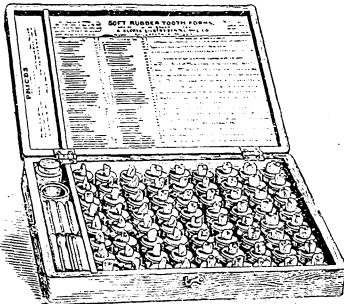
has been made in the recent improvements added to the

SHARP SEAMLESS CROWN OUTFIT

We were easily the leaders in the race with the No. 1 outfit, but with the improvements embodied in the new models No. 2, No. 3 and No. 4, there is absolutely nothing to compete.

The Draw Press is so improved as to save 75% of the time formerly required to draw the seamless cap.

Our new Tooth Form is so constructed that a SHORT, MEDIUM OR LONG CROWN can be made from the same form, vastly increasing the scope of the application of this system to the needs of the practitioner.



DON'T PURCHASE A CROWN OUTFIT UNTIL YOU HAVE SEEN THIS ONE.

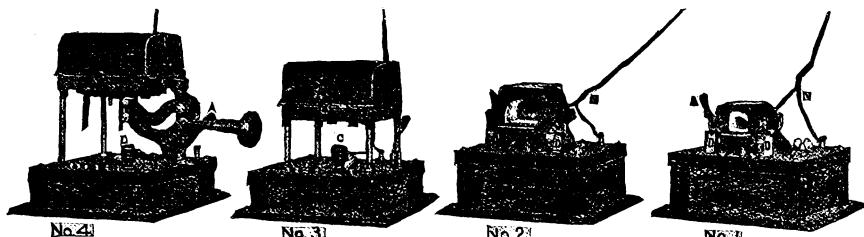
Send for descriptive matter.

Ask Your Dealer to Show You the Outfit.

S. ELDRED GILBERT DENTAL MFG. CO.

1627 COLUMBIA AVE., PHILADELPHIA, PA., U. S. A.

The Hammond Electric Dental Furnaces



No. 4 Drop Bottom Continuous Gum Prices: \$89.00
No. 3 Plain Continuous Gum \$75.00
No. 2 Crown and Bridge \$45.00
No. 1 Inlay \$35.00

Size of muffles: No. 3 and 4, 3x3x1 $\frac{3}{8}$ inches; No. 2, 2x2 $\frac{1}{4}$ x1 $\frac{1}{8}$ inches; No. 1, 1x1 $\frac{1}{4}$ x15-16 inches.

The Electric Furnace is the only thoroughly satisfactory agent for fusing inlays and baking all porcelain work for bridges, crowns and plates.

NO NOISE, NO SMELL, NO DISCOLORATION FROM GASSING.

Among those now on the market, The Hammond Dental Electric Furnaces mark an entirely new departure.

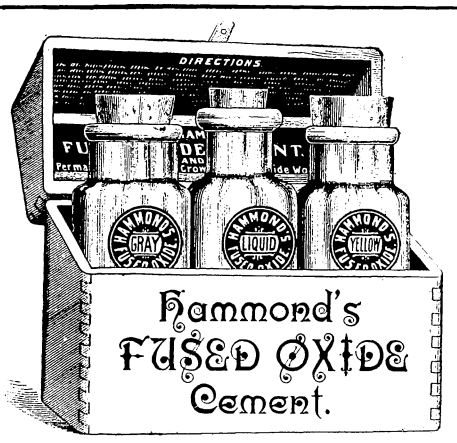
They combine the utmost simplicity of construction and operation with a durability and efficiency not approached by any other furnace made.

Each furnace is under the most perfect control of the operator, so that he is able to secure just the degree of heat necessary to do the particular work in hand.

The working parts of these furnaces are interchangeable, so that in case of accident they may be removed and replaced in the shortest time. Send for circulars and testimonials.

HAMMOND FUSED OXIDE CEMENT

FOR PERMANENT FILLINGS, CROWN AND BRIDGE WORK.



This cement has been on the market for 12 years and will please you. It has no equal for inlay and crown and bridge work, holding with a grip that is unaffected by the varying conditions of the mouth. The liquid does not crystallize in any climate. The powder is very fine and without a peer.

The following tests show for themselves, and are reproduced accurately from ITEMS OF INTEREST for November, 1898, pages 810 and 811, and were made by Dr. E. K. Wedelstaedt, of St. Paul, Minn.

HAMMOND'S FUSED OXIDE, rolled (mallet)	177
HAMMOND'S FUSED OXIDE, soft	94
Ames' Metalloid, rolled (mallet)	170
Ames' Metalloid, soft	94 4-9
Justi's Insoluble, rolled (mallet)	148
Justi's Insoluble, soft	70
Weston's Insoluble, rolled (as per directions accompanying cement)	113
Weston's Insoluble, soft	62 $\frac{3}{4}$
Caulk's, stiff mix	79 $\frac{3}{4}$
Caulk's, soft	20
Britton's, rolled	57 $\frac{1}{2}$
Britton's, soft	45

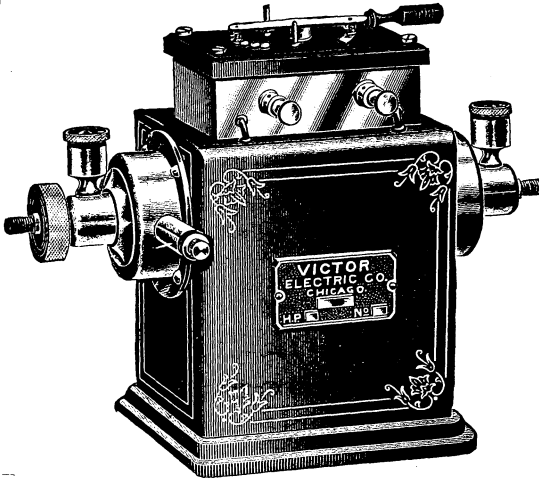
This cement is not only the best but is supplied in liberal packages in the following colors: Yellow, Gray, Cream, Green Gray and Deep Gray. Price, \$1.00, one color and liquid; \$1.50, two colors and liquid.

SOLD BY ALL FIRST-CLASS DEALERS.

Manufactured
by

JOHN F. HAMMOND,

35-43 West 125th St.,
NEW YORK, N. Y.

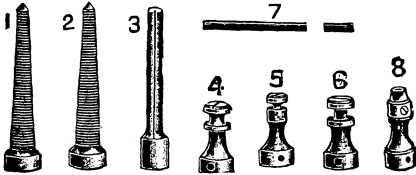


TRADE-MARK.

Think!

Before you place your order for an electric lathe or engine; that's all we ask of you. You know we can save you money and we are ready to prove the superiority of our goods. We don't claim that we will give you something for nothing. But we will give you full actual value for your money. ♡ ♡ ♡ ♡ ♡

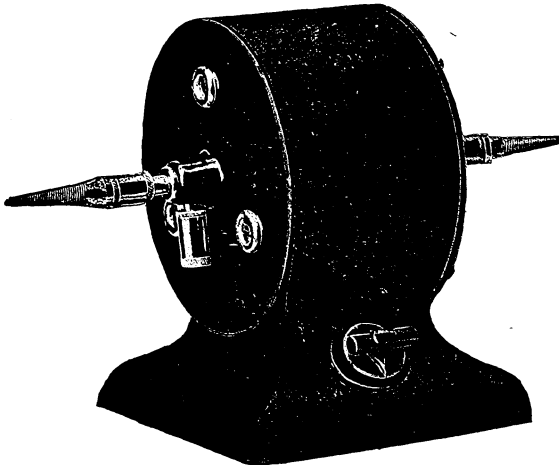
Write to Us.



Victor Electric Co.
61 Market St., CHICAGO, ILL.

ACME OF PERFECTION

Saranac Dental Appliances



Made for...

ALTERNATING AND
DIRECT CURRENTS

000

Our Engines and
Lathes are
Fully Guaranteed
in every
respect.

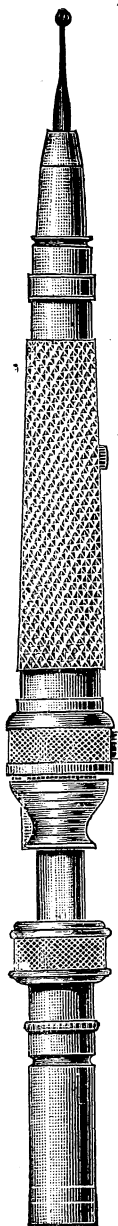
000

Ask for Catalogue No. 6
We solicit your correspondence

Saranac Electrical Mfg. Co. ST. JOSEPH, MICHIGAN

HAND-PIECE, No. 7, Price, \$10.00

For sale by Gustav Scharmann



Dr. Abraham's Oxyphosphate of Zinc Cement

MADE IN GERMANY

5 COLORS

White Yellow Grey
Light Yellow Light Grey

ADAPTED FOR FILLING TEETH AS WELL
AS FOR CROWN AND BRIDGE WORK

PRICES { Per Box, - \$1.50
Extra Liquid, .75

WRITE FOR PARTICULARS IN
REGARD TO SAMPLES

SOLE IMPORTER

GUSTAV SCHARMANN

1181-83 BROADWAY, N. Y. CITY

FOR SALE BY GUSTAV SCHARMANN



RIGHT-ANGLE
ATTACHMENT, No. 2

Price. \$6.00

W. J. TRUMPOUR, Mgr.

DR. J. C. McLEAN, Sup't



It's no Longer a Question

as to where dentists receive the best workmanship and materials or the most prompt service, as the

Atlas Dental Laboratory Co.

is admitted by all first class dentists who are in a position to judge, to have the largest and most competent aggregation of expert mechanical workmen ever before known to operate under one management, and their business methods are in strict harmony with their work and materials. Others may duplicate their prices, but that's all.

Is the Best Too Good for You?

"Catalogues mailed upon application." Highest prices paid for gold and platinum scrap.

ATLAS DENTAL LABORATORY CO.

Over The S. S. White Dental Mfg. Co.

35-37 RANDOLPH STREET, CHICAGO, ILL.

Telephone Central 1780.

W. H. STOWE, President.

F. F. EDDY, Treasurer.

Boston Dental Laboratory Company

171a Tremont Street, Boston, Mass.

HAND CARVED TEETH

MADE TO ORDER FOR EACH CASE.

SEND FOR CATALOGUE AND PRICE LIST.

The largest and best equipped establishment in the world, devoted exclusively to fine mechanical work of every description for the Dental Profession.

SPECIALTIES:
CARVED TEETH
CONTINUOUS-GUM
CROWN AND
BRIDGE WORK.

ODONTUNDER.

Over Ten Years' Standing Without a Single Fatality.

Write for our Special Terms.

Odontunder is Guaranteed to give Perfect Satisfaction.

Odontunder will not deteriorate. Every bottle guaranteed. Cash to accompany order or goods sent C. O. D.

Single Bottles, 2 oz., \$2.00 by Express.

Three Bottles, 6 oz., \$5.00 by Express prepaid.

Six Bottles, 12 oz., \$10.00 by Express prepaid.

Beware of any one else offering Odontunder for sale or claiming to have bought the formula. Odontunder is sold only from the house direct.

Odontunder Manufacturing Co.,

FREDONIA, N. Y.

References: Commercial Reports, Fredonia National Bank.



Steurer's Plastic Gold. (Improved.)



This is a chemically pure gold in a plastic state, without admixture of any foreign substance, and has been extensively used by dentists at home and abroad for the past eleven years. In its improved form it does not crumble, but when properly annealed works like wax, and denser fillings can be made by hand pressure than with foil by means of a mallet.

It is a great time saver. It will not "ball," but spreads under the plugger and so adapts itself perfectly to the walls of the cavity. Can be used for contour work and will unite with any pure gold.

It is put up in two styles: Small square pieces, in 1-16 oz. vials; Large square pieces, in 1/8 oz. boxes.

Do not be imposed upon by imitations, as this is the only "Plastic Gold in the world" that has kept up its reputation for so many years.

Price per Bottle, 1.16 oz., \$2.50

Price per Box 1/8 oz., 5.00

Cash with all orders.

Sold at all Dental Depots.

Steurer's Automatic Annealer and Water Heater.

You cannot expect your gold to work well unless it is properly annealed.

As ordinarily done, it is mere guesswork, and is as liable to be wrong as right.

It is wrong to anneal over a naked alcohol flame (as is often done), because it is apt to become contaminated with carbon.

Metal plates get too hot, mica slivers and mixes with the gold. This is all overcome by the use of "Steurer's Automatic Annealer," which always anneals just right, never getting too hot, no matter how long you leave it over the flame. Used with an alcohol lamp. Simple and strong in construction, and no parts to get out of order.

By removing the annealing plate and substituting the aluminum cup, hot water can be obtained in a few moments.

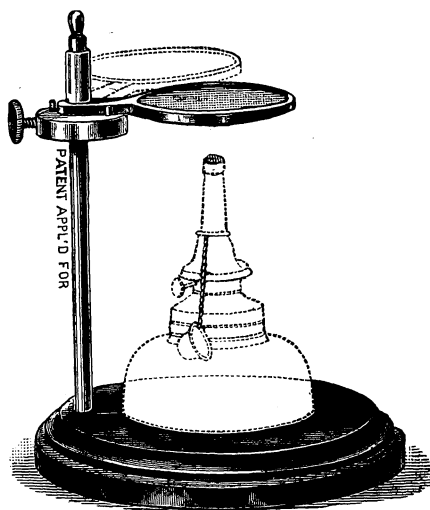
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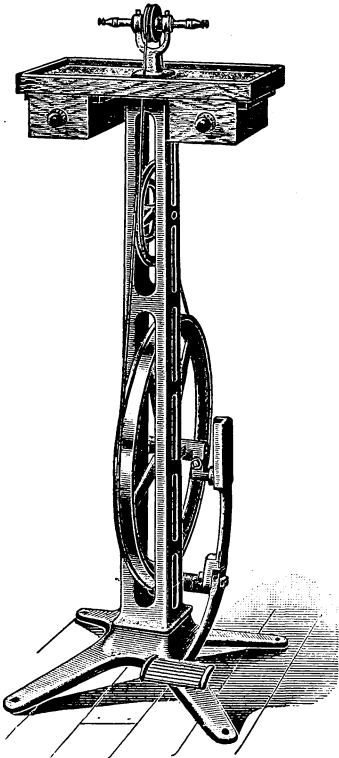
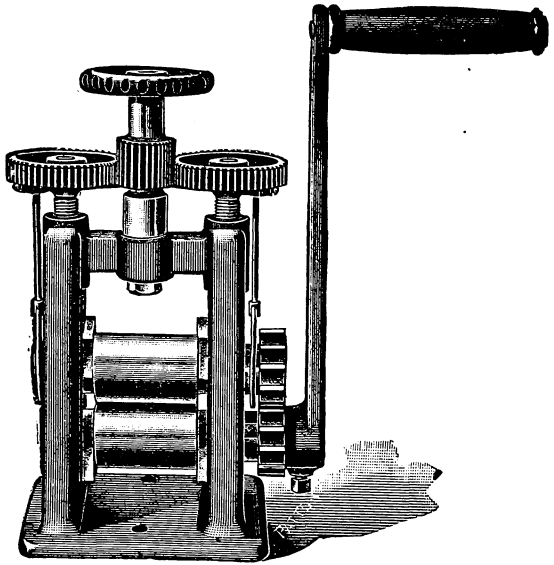
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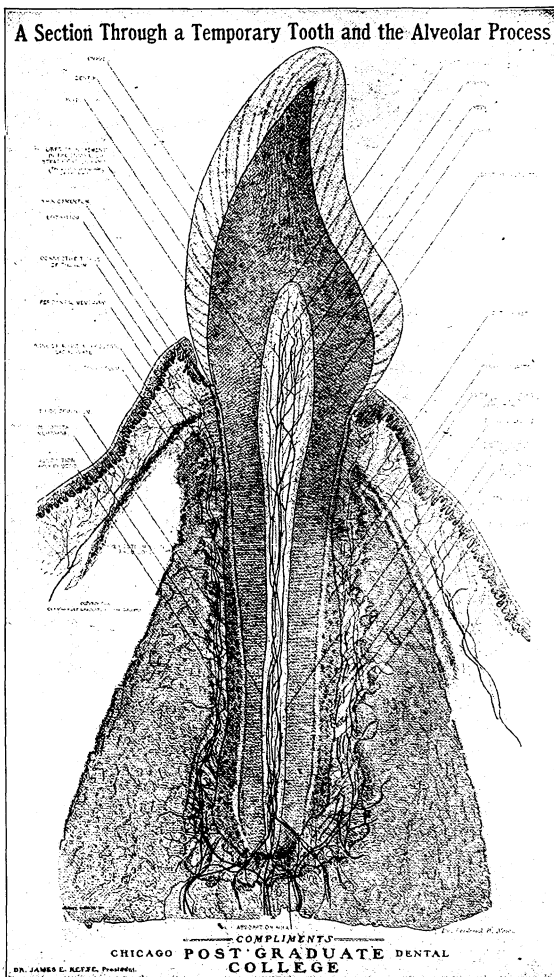
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Close	OCTOBER 17
Examinations for advancement begin	SEPTEMBER 28
Opening of regular session, 8:30 A. M.	OCTOBER 7
Matriculation for full regular session closes	OCTOBER 17
Final examinations begin:	
Senior Class	APRIL 13
Junior and Freshman Classes	APRIL 28
Commencement Exercises	MAY 7
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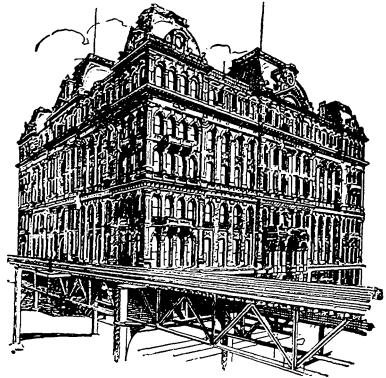


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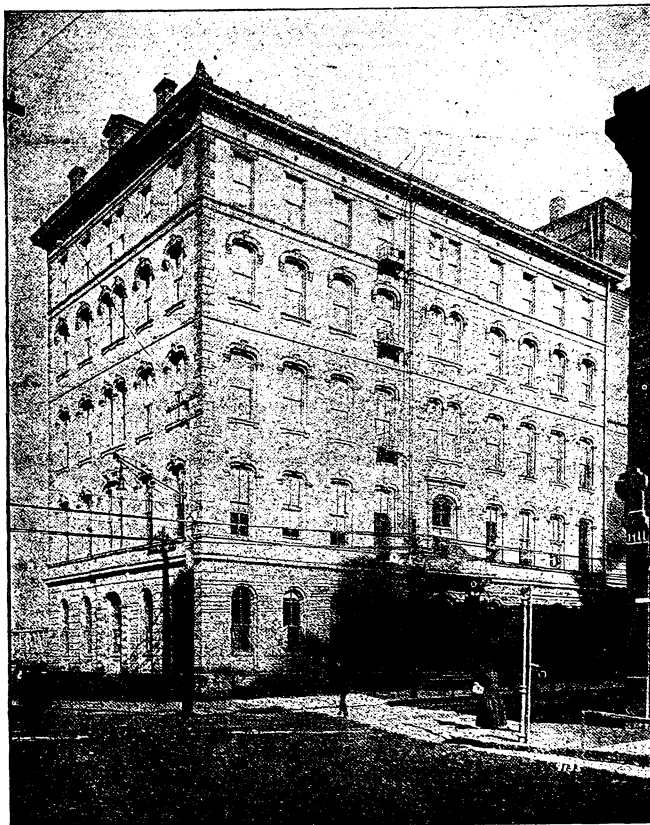
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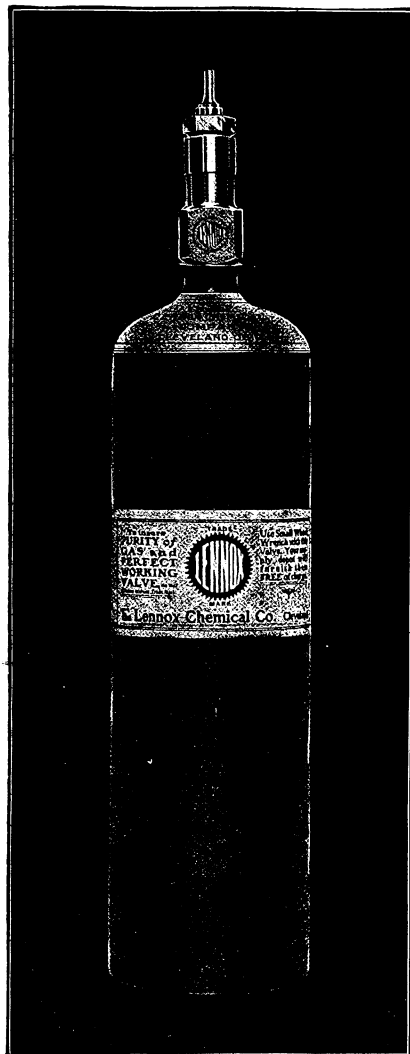
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